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HYDATID CYSTS IN CHILDREN

WITH REPORT OF THREE CASES

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AS DÉVÉ has pointed out, the seeds of echinococcosis are sown in infancy, and it is the extreme latency of the disease which is responsible for the fact that the majority of hydatid cysts cause no symptoms until the patient has attained the age of from 20 to 40 years. To this latency there are, of course, for mechanical reasons, exceptions: thus, the average age at which hydatid cysts of the heart have been reported (and all such cases up to now have been autopsy findings) is twenty-three. Again, hydatid cysts of the brain are seen seven times as often in children as in adults, this situation being third in point of frequency in children, as against eighth in adults (the exact figures are 4.3 per cent in children, and 0.6 per cent in adults, Dévé). The end-results of surgery here are relatively inefficacious, though Castro had a case well 5 years after operation (Lagos Garcia, who quotes four personal cases). The immediate results, however, so far as life is concerned are surprisingly good, as Lendon pointed out as far back as 1903—50 per cent recoveries. For similar reasons, i.e., mechanical ones, hydatid cysts of the orbit invite an early diagnosis (Solares, child aged 6; C. D. Marshall, girl aged 5; Cúneo, girl aged 5; Machkowzewa, child aged 2; Cabaut, child aged 2; Rudolph, 4 months old baby), though even here the extreme latency of the disease is shown in the case of Demicheri, quoted by Santanowsky, in which the evolution extended over 10 years Satanowsky also quotes the case of Papaioanon (cited by Demeria) of a boy aged 12, who had had an orbital tumor for 6 years.

Dévé has laboured the fact that in children the hydatid cyst is a simple one without complication, whereas in adults it is already an old one. Lagos Garcia found daughter cysts in only 23 out of 274 cases in children, and such cysts were never found in the lung or kidney. Therefore, if one wants to study the disease in its uncomplicated form, it is well to do so in a child under 15 years of age; pathology gleaned from adults is here misleading.

Passing over, as open to doubt, the so-called congenital cases (Cruveilhier, hydatid cyst of the liver in a 12 days old infant; Heyfelder, multiple hydatid cysts of the placenta and cord in a 7 months old fetus; Hemmer, abdominal echinococcosis in a fetus causing dystocia) we come to the possibly authentic cases of Arquellada (abdominal cyst in a 7 months old infant in which the pathologist reported the finding of hooklets), and Rudolph (hydatid cyst of the orbit, the size of a hen's egg, in a 4 months old baby). Vegas and Cranwell, however, state that there is no authentic case in a sucking infant.

As a matter of fact, it is natural that children should be more likely than adults to contract the disease, for the intimacy of children with dogs is notorious, as also is their hygienic

carelessness. The affection is undoubtedly rare up to the age of 4, but markedly increases up to the age of 8. At the age of 3, however, 8 cases have been reported by Vegas and Cranwell, 12 by Lagos Garcia, 4 by P. de Pena, and Posadas reported the case of a hydatid cyst in the brain of a child of this age, which had caused symptoms for a year.

At the age of 2, hydatid cysts have been reported by Machkowzewa (orbit), Cabaut (orbit), Pericic (neck), and Lagos Garcia (liver). Kapsammer had a small patient aged 9, who had passed hydatid cysts in the urine since the age of 6 months (Dévé).

The great majority of early cases can be explained by precocious extra-uterine contamination.

In South America, where extreme familiarity with the disease renders early diagnosis the rule, the frequency in children under 14 years old is well recognised, Vegas and Cranwell giving the incidence as 26.2 per cent, and Prat of Uruguay as 23 per cent. It should be stated, however, that the more recent statistics of Greenway[1], based on 2,740 cases, showed an incidence of only 11 per cent in children under the age of fourteen, and 0.54 per cent for children under the age of four. This drop is probably due to the excellent prophylactic propaganda which has in late years been carried on.

Because the hydatid cyst in the child is a young cyst, it is univesicular in over 90 per cent of cases (Dévé, 90 per cent; Lagos Garcia, 91.6 per cent; P. de Pena, 92 per cent).

Again, as a hydatid cyst in man usually remains sterile until it becomes the size of a hen's egg, acephalocysts are common in children. Another point to note is that the proportion of suppurating cysts rises with the age of the patient (Dévé, 1917). It is twice as frequent in adults as in children; the exact figures are 13.8 per cent for adults, as against 5.9 per cent in children (Vegas and Cranwell). Lagos Garcia remarks that while suppuration is very rare, it is, nevertheless, the commonest complication in children, the lung being the most frequent site. For the same reason, because it has not had time to develop, secondary abdominal echinococcosis is twice as rare in children as in adults, and this although hydatid cysts of the liver have a greater tendency to rupture into the abdominal cavity in children than in adults. In this connection it may be mentioned that such rupture in children frequently passes unnoticed for many years.

As regards diagnosis, large symptomless liver lesions present an easier problem in children than in adults, because such conditions as cancer, syphilis, and the various forms of cirrhosis can usually be ruled out. There are, however, exceptions to this statement; thus, sarcoma of the liver, fibrosarcoma of the costal margin, gumma of the liver, and hepatic hypertrophy of cardiac origin (Morquio) have all been mistaken for hydatid cysts.

Eosinophilia is notoriously inconstant in children, and the complement fixation test fails in 10 per cent of cases.

As regards treatment, the young simple cyst of the child lends itself more readily to the closed method than does the old and often complicated cyst of the adult. Lagos Garcia advocates it in the absence of pericystic suppuration or daughter cysts; he practices fixation to the abdominal wall, and points out that in suitable cases a cure may be effected in 10 days.

In the case of the lung, however, the prognosis is, as a matter of fact, worse than in the adult (Dévé). Hydatid infantilism has been described by Dévé, who reported five cases in 1920.

Largos Garcia noted hydatid fremitus in 8 of his cases (7 liver, and 1 secondary abdominal cyst). He reported 1 case of hydatid-entérie. He noted that miliary tubercles in children may be indistinguishable from pseudotuberculous echinococcosis.

The extreme latency of the disease has been referred to above, exact details, however, in this respect, are difficult to arrive at in man, and even more so in animals. Generally speaking, such cysts grow quicker in children, because of the succulence of the latter. Incidentally, for the same reason, it is much easier experimentally to inoculate young animals than old ones.

In the case of the lung, Escudero has pointed out that an hydatid cyst is not likely to attract attention until it has existed for at

[1] Second Nat. Congress of Med., Buenos Aires, 1922.

least 2 years. An hydatid cyst grows more quickly, for mechanical reasons, in the lung than in the liver; 76.2 per cent of hydatid cysts in children are situated in the liver.

An Australian surgeon (MacLaurin, 1914) has drawn attention to the connection between the incidence of hydatid cysts in man and plentiful rainfalls, the latter occurring about every 6 years. Isolated instances in which it was possible to gauge the latent period have been recorded by Watson, 22 years; Cudmore, peritoneal cyst, 30 years; Phillips (Canal Zone), hydatid cyst of the pancreas in a Russian male, probable duration 33 years, i.e., infected at the age of two; Horand (cited by Desplas, Boppe, and Bertrand), hydatid cyst of the bone, 39 years.

It is not, therefore, difficult to understand and accept Dévé's statement: "Echinococcosis is a disease of early life—aye, of infancy."

DISTRIBUTION OF ECHINOCOCCOSIS IN CHILDREN

While scattered records of hydatid cysts in children are found in the literature of all nations, it is to certain parts of South America that one must go for clinical material on a large scale. The abundance of the latter in Buenos Aires and Montevideo is such that the leading surgeons there are all experts in the matter. And in so far as the disease especially affects children, such men as Lagos Garcia, de Pena, and Morquio are world wide recognized authorities.

From such a wealth of material, it is obviously possible, in a paper of this kind, to select for mention only a few illustrative cases. The following reports from the various countries of the world are, with a few exceptions, comparatively recent, by which I mean that they are subsequent to the only exhaustive review of echinococcosis in this country—that of Lyon, published in January, 1902.

Argentina. D. S. Cúneo reported 9 cases, 1 of the orbit in a girl aged 5, 1 of the ovary in a girl aged 15, and 7 of the liver in children aged 10 to 15.

Vegas and Jorge published a case of hydatid cyst of the bladder in a boy aged 14; operation; recovery.

Lagos Garcia reported a case of multiple hydatid cysts of the liver in a boy aged 6; complement fixation test was positive, and eosinophilia 16 per cent. At a first sitting, four cysts were treated by the closed method, and a fifth, which contained bile, was marsupialized. At a second intervention, 6 months later, five more cysts were dealt with, and forty more counted. In 1924, he also reported a case of hydatid cyst of the lung opening into a bronchus in a 7 year old girl. The X-ray cleared up the diagnosis (from interlobular pleurisy).

Maidagan published a case of solitary hydatid cyst of the mesentery in a girl aged 4. The site is rare, Vegas and Cranwell's statistics contained two such examples in 419 cases of children aged 3 to 15. Lagos Garcia's thesis (1908) contained none.

Blaksley's case of an hydatid cyst in the inguinocrural region of a girl aged 16 is also of interest, because of the rarity of the situation. So also is Garrahan's multivesicular abdominal hydatids simulating bacillary peritonitis in a 10 year old girl.

Zerbino reported two cases of echinococcosis of the lung in children, both of which were cured by spontaneous vomica.

Chueco published a case of an "hydatid cyst in the posterior wall of the uterus in a virgin aged 15." The real explanation in such cases is usually secondary peritoneal hydatid cysts, which have barged into, and become incorporated with the uterus, ovary, or prostate. Villa, however, reports what appears to be an undoubted case of primary hydatid cyst of the uterus in a 15 year old girl.

Vegas, on March 17, 1923, communicated to me privately the report of a case of a boy aged 9, in whom, postmortem, was found an hydatid cyst of the heart. Operation was performed on July 23, 1905, for thoracic hydatid cyst. The patient died on August 1, 1905. Postmortem: multiple hydatid cysts of the lung and liver, and an hydatid cyst, the size of a hen's egg, in the right auriculoventricular sulcus were found (see frontispiece).

Dimitri and Taubenschlag reported a case of an hydatid cyst of the brain in a girl aged 12; she remained well for 3 years after the operation, but the disease then recurred, and she died from meningoencephalitis, following a second two-stage operation.

Aguirre's case was that of a girl aged 9 with an hydatid cyst of the kidney, for which nephrectomy was done; the condition was discovered accidentally at operation. The pre-operative diagnosis was hydatid cyst of the liver. There was no renal symptomatology.

Navarro and Finochietto's case of multiple hydatid cysts of the liver in a girl aged 9 was notable in that from 80 to 100 cysts were present. The left lobe only was operated upon, as it was the least affected. Twenty-five cysts, of the size of a nut to a hen's egg, were treated by the closed method and the patient recovered. The authors regard this as an example of secondary echinococcosis from intrahepatic rupture of a liver cyst, without peritoneal infection.

Muniagurria reports a hydatid cyst of the lung in a boy aged 13, the boy was operated upon successfully by the Lamas-Prat-Mondino technique.

Rivarola refers to 21 operative cases of hydatid cysts of the brain in children: 8 were "cured," 13 died; a mortality of 61.9 per cent.

Uruguay. Fournier reported intraspinous hydatid cysts in a boy aged 12. He had sudden paraplegia. X-ray examination showed rarefaction of the fifth dorsal vertebra and of the sixth rib. He was operated upon successfully. This condition may be confounded with primary vertebral osteitis.

Ponce de Leon reported a case of death following lumbar puncture for a hydatid cyst of the brain in a boy aged 11. An enormous hydatid cyst occupied almost all the right parietal and occipital lobes. In the discussion, Morquio mentioned a case in which progressive blindness was the only symptom.

R. Gomez recorded the case of an hydatid cyst of the liver with intraperitoneal rupture and insemination. One year later, multivesiculation of the liver cyst (Dévé's defense reaction) was found to obtain, and the free edge of the omentum, which was adherent to the liver cyst, was full of tiny cysts, from the size of a grain of sand to that of a hazelnut. It might have been well in this case to wash out the abdominal cavity with ether on the occasion of the rupture of the liver cyst.

Pelfort (service of Morquio) described an hydatid cyst of the lung cured by vomica in a boy aged 11.

Alice A. Ugón reported the case of an hydatid cyst of the lung cured by spontaneous vomica in a boy aged 6.

L. Morquio published the following cases: Hydatid cyst of the brain in a girl aged 12. Hydatid cyst of the brain in a boy aged 11, operated upon in two stages, death the next morning; postmortem, hydatid cyst the size of a fetal head in the right hemisphere. Hydatid cyst of the brain in a girl aged 13, who died the day after operation. Hydatid cyst of the brain in a girl aged 10; complement fixation test and Casoni negative: no eosinophilia. He points out that in these cases the value of the complement fixation test has been exaggerated. Latency may extend to years. They are usually single. Rarely are daughter cysts found. The size of the cyst may be enormous. Operation is useful in the case of small superficial cysts, with central cysts it is usually fatal. In only one of his brain cases (boy aged 6) was operation successful. In a few months he saw seven certain cases and three in which he suspected hydatid cyst of the brain in a few months. He confirms the usual absence of increased eosinophilia in cases of hydatid cysts of the brain. The author quoted three personal cases of hydatid cysts of the neck in children.

Spain. A. Martin recorded the case of a retrovesical hydatid cyst in a boy aged 13. Treatment by aspiration of contents through the rectal wall was successful in this, as in three other cases.

Coronas reported two cases. One was an alveolar echinococcosis of the liver in a boy aged 8, the first case observed in Spain. The pre-operative diagnosis was multilocular hydatid cyst. The postoperative diagnosis was multiple inoperable hydatid cysts. At postmortem, 22 cysts were found in the liver. Cysts were also found in the spleen, kidney, and lung, and a subcutaneous one in the left leg. Pathological report: echinococcosis alveolaris. The other patient, a boy aged 9, had a single small hydatid cyst of the liver, with enlargement of the liver and spleen, and intense icterus, which lasted for 5 years. A tumor could be seen through the abdominal wall. Postoperative diagnosis: unilocular hydatid cyst. The author mentions a case in which he mistook a lipoma of the leg for a hydatid cyst on the strength of marked eosinophilia and positive complement fixation test.

Cardenal and Castella published the report of a case of a hydatid cyst of the brain in a boy aged 14. On decompression over the left Rolandic region, multiple hydatid cysts poured out of the opening. The membranes were extracted and the cavity packed with gauze, which was all removed by the sixteenth day. Practically complete recovery ensued. Symptoms of epilepsy, which had obtained before the operation, disappeared. One subsequent convulsion occurred 7 months after operation. The ultimate prognosis is not good in these cases.

Nogueras described hydatid cysts of the neck in two children, aged respectively 6 and 12. The latter patient had a primary hydatid cyst of the liver also. The treatment adopted was formolage, evacuation, and suture.

De la Mata recorded the case of an hydatid cyst of the sternomastoid in a boy aged 4; excision; cure.

J. Garcia del Diestro published the case of an hydatid cyst of the lung in a boy aged 13, whose appearance was tuberculous. He had dyspnœa. Eosinophilia was 3 per cent. Complement fixation test was negative. Vomica occurred the night before he was to have been operated upon. Urticaria and pleuritis were noted on the fourteenth day; and he spat up hydatids on the sixteenth day. On the twenty-second day, eosinophilia 30 per cent obtained, and the complement fixation test was positive. Ultimate results were good. Hæmoptysis is an important symptom here, as it is unusual in infantile tuberculosis. This is an example of spontaneous cure by vomica.

Brazil. Max Rudolph reported the case of a Portuguese baby, aged 4 months, with an hydatid cyst of the orbit. An enormous tumor, the size of a hen's egg, developed in 16 days. The eyeball was intact. The fluid contained succinic acid.

France. Beauduin recorded the case of an hydatid cyst of the brain in a boy aged 15. The operative mortality in 36 cases collected by the author was 72 per cent.

Verdelet published 3 cases of hydatid cysts in children. The first was that of a girl aged 8, with a paranephritic hydatid cyst; operation; cure. The second, a Belgian boy aged 10, with a hydatid cyst of the neck; operation; cure. The third, a Belgian boy aged 11, with multiple hydatid cysts of the abdomen. Ablation of 12 cysts was done; death occurred from shock 36 hours later.

Adam quoted a postmortem case of echinococcosis bavarotyrolienne in an idiot boy from Ain, who was accustomed to eat slugs, frogs, etc. This was the third case of this rare disease observed in France, the first case having been reported by Hayem of Paris in 1869, and the second by Demateis of Genoa in 1890. A fourth case has since been reported by Mallard and Favre of Lyon.

Lavillat reported two cases. Hydatid cyst of the lung in a girl aged 9; operation; recovery. Hydatid cyst of the lung in a boy aged 10, spontaneous cure by vomica.

Bertrand and Medacovitch published the postmortem case of a hydatid cyst of the brain in a boy aged 15. Practically the whole of the left cerebral hemisphere was destroyed.

Rocher and Masse recorded the case of an hydatid cyst of the liver in a boy aged 7. The complement fixation test was negative, and eosinophilia not increased. He was operated on by the closed method, and rapid recovery resulted.

Nové-Josserand reported the case of an hydatid cyst of the iliac bone in a girl aged 13½. The picture suggested cystic osteosarcoma. Operation; death.

Italy. Chelini published the case of a baby aged 5 with an hydatid cyst of the right lung. Operation consisted of cutaneous incision of Schede, resection of 4 centimeters of seventh and eighth ribs; incision of pleura and suture of parietal to visceral layers; pneumotomy with cautery; evacuation of cyst contents. The wound healed on the twenty-eighth day.

Longo recorded the case of an echinococcus cyst of the kidney in a girl aged 7. The tumor was the size of a child's head. Eosinophilia 60 per cent. Marasmus for 5 months, but no urinary symptoms. At operation the contents, including one daughter cyst, were removed, and the cavity packed with gauze. Fever for 20 days. Good recovery.

Fioravanti saw three cases. The first was that of a child aged 3 with an echinococcus cyst of the left lobe of the liver. Marsupialization was done and child discharged in 50 days. In the second case, an hydatid cyst of the mesentery in a boy aged 14; an incision was made, and fœtid pus containing daughter cysts evacuated; the cavity was packed with iodoform gauze, and patient was discharged cured in 2 months. The third case, a child aged 3, had a hydatid cyst of the transverse mesocolon, which contained daughter cysts. Marsupialization was done and child discharged cured in 45 days.

Iavarone recorded the case of an echinococcus cyst of the liver in a boy aged 6, he was operated upon and cured.

In Lama's case the X-ray demonstrated typical hydatid cyst in the left lung of a boy who had been ill for 6 months. Casoni positive. Operation resulted in recovery.

Baccarini described an hydatid cyst, the size of a hen's egg, in the left side of the neck in a boy aged 10. Hooklets were demonstrated. Out of 116 cases of hydatid disease in children in the services of Morquio and de Pena, only 3 were found in the neck.

Genoese published the case of a girl aged 7 with hydatid cysts in both lungs. Biological tests all failed, but the X-ray cleared up the diagnosis. Cysts in one lung were successfully operated on; those in the other lung were left for a future occasion. In Thorstensen's 920 cases in Iceland, only 4 were in children aged from 4 to 10.

Sabatini's case was that of a boy aged 14 with an hydatid cyst of the brain, which ruptured into the longitudinal sinus. Severe anaphylaxis; urticaria; cyanosis; dyspnœa; collapse; death.

Australia. The prevalence here of the disease can be judged by the size of the personal statistics; thus, Barnett reported 302 personal cases. MacLaurin had had, up to 1907, 140 personal cases of hydatid cysts of the liver; he mentioned that 70 cases were operated on in Sydney in 2 years, and that the disease was uncommon until 20 years before. K. D. Fairley stated that from 1908 to 1921, 258 verified cases were admitted to the Melbourne Hospital. O'Hara referred to several hundred personal cases, but thinks that the disease is less prevalent in Victoria than it was 30 years ago. The list of cases here selected must necessarily be brief.

Ritchie recorded 2 cases in children. The first was that of an hydatid cyst of the lung in a boy aged 11; operation; cure. In the second, an hydatid cyst of the liver in a girl aged 7 had been removed in 1899; subsequently, cysts in the right buttock and below the left costal arch appeared; the cyst in the buttock disappeared after traumatic rupture.

Joske described the case of an hydatid cyst at the apex of the left scapula in a boy aged 9. The cyst was suppurating and contained daughter cysts and fragments of bone. The tip of the scapula was necrotic and two contiguous ribs were fractured. This was the only case the author had seen of fracture of the rib from hydatid disease.

Anderson published the case of an hydatid cyst of the lung in a girl aged 7. Operation: the cyst contained fœtid pus and communicated with the bronchi. There were no daughter cysts. Recovery resulted.

Verco and Poulton reported hydatid cysts of the brain and heart in a boy aged 14. The brain cyst was operated upon in two stages. The temperature rose to 105 degrees F. on the seventh day, and death occurred on the fifteenth day. Postmortem, two other cysts were found in the brain and one in the heart.

J. Ramsay saw over 100 cases of hydatid disease in Tasmania in 17 years. He quoted the case of an hydatid cyst of the liver in a girl aged 4. The common duct was blocked by daughter cysts.

Ryan described an hydatid cyst of the brain in a girl aged 6½. A tympanitic note on percussion of skull was noted. Operation was done in two stages. The cyst occupied a large part of the left cerebral hemisphere. The bone was not replaced. A small rubber drain was inserted. Recovery occurred. Eleven weeks after operation, the optic neuritis had disappeared, and speech was almost normal; there was still some right foot drop.

Pitts reported the case of a girl aged 5, who died suddenly after a fall on her abdomen. Postmortem, two hydatid cysts of the liver, the size of a tangerine and cricket ball, were found; one had ruptured into the inferior vena cava. The right auricle and ventricle were filled with hydatid membrane. Death from massive embolism occurred.

Cudmore recorded the case of an hydatid cyst of the liver in a child aged 4; operated on by the Thornton method. The wound healed on the seventh day. On the eighteenth postoperative day, the incision was found to be bulging, and one ounce of bile-stained pus was let out.

Watson stated that he had seen 3 cases of hydatid cysts in children under 4 years of age, each of which was as large as a child's head.

British (other than Australia). Colman saw a postmortem case of an hydatid cyst of the spinal cord in a boy aged 10.

Dalton described the case of an hydatid cyst of the liver in a girl aged 11. Hydatidentérie was observed, also the discharge of daughter cysts via the bronchi. Follow-up history; at the age of 16 her abdomen was frequently tapped. She was well thereafter for 6 years. At the age of 23 she died from septic peritonitis. Postmortem: an old hydatid cyst of the liver was found, communicating with the bile ducts and with a dilated bronchus.

Stiles recorded the case of an hydatid cyst of the liver in a boy aged 8, from Shetland. Operation; recovery. He also had a case of hydatid cyst of the liver in a girl aged 9, who came from Shetland; symptoms for 3 years; no history of association with dogs; hydatid fremitus marked. At operation three-fourth gallon of clear fluid and one daughter cyst, the size of a Bantam's egg, were evacuated. Marsupialization and drainage was the treatment adopted. An hydatid rash appeared and lasted for 48 hours. Recovery.

Ashby published the case of an hydatid cyst of the brain in a boy aged 8½, who died comatose. Postmortem, a large unilocular hydatid cyst in the right frontal lobe was found. Scolices were demonstrated. The first focal symptom (except local pain) was twitching of the face on the same side as the lesion, the cyst bulged mesially and compressed the face center of the opposite side.

Marshall described the case of an hydatid cyst of the orbit in a girl aged 5. Operation: cyst easily enucleated. No scolices were found. Typical laminated membrane was demonstrated. Complete recovery with normal vision resulted.

Owen (Melbourne) saw a case of hydatid cyst of the spine in a girl aged 13. Laminectomy of sixth, seventh, and eighth dorsal vertebræ was performed. Daughter cysts were found. The wound was closed without opening the dura.

Cotterill exhibited a specimen of a large hydatid cyst removed from a child from Shetland, aged 4 years.

Hogarth reported a case of an hydatid cyst of the liver in a girl aged 12. Daughter cysts obtained. Marsupialization was the treatment adopted, and ultimate recovery occurred, though bile escaped for a long time.

Cameron's case was that of a girl aged 10, from Shetland (where the disease is fairly common) with a large suppurating abdominal cyst. Most of the sac was resected, and the rest marsupialized.

Walker (South Africa) published the case of an hydatid cyst of the floor of the mouth in a Kaffir female aged 6. It was excised with a part of the submaxillary gland. The cyst contained scolices, hooklets, and daughter cysts. Rapid recovery.

Buckley totally enucleated two hydatid cysts from the liver of a girl aged 13; recovery resulted. Posadas practiced a similar procedure in 20 cases in patients under the age of 13, the youngest aged 3.

Corner quoted the case of a pedunculated hydatid cyst of the liver in a girl aged 3; resection; recovery. He remarked that in inflamed liver tissue the stitches hold better than in normal liver tissue.

Lapage operated upon an hydatid cyst of the brain in a boy aged 10. The boy died in 3 weeks from hernia cerebri and meningitis. There was no postmortem. The pathological report was "hydatid cyst."

Caiger (South Africa) reported the case of an hydatid cyst of the brain in a boy aged 6, in whom enlargement of the head had been noted for 2 years. At postmortem, a large cyst was found containing 8 ounces of clear fluid, distending the right lateral ventrical. No hooklets, but typical laminated cyst wall was found.

Hughes described the case of an hydatid cyst of the liver in a boy aged 11. Operation; daughter cysts; marsupialization and drainage. Hooklets were demonstrated. The cavity was irrigated with formalin for several weeks, when it healed soundly.

Sargent published the case of an hydatid cyst of the brain in a child aged 12. At operation a large hydatid cyst was removed; it reached the surface just behind the left fissure of Rolando. The diameter of the cyst was 6 centimeters, and it contained 60 cubic centimeters of fluid. Had postoperative convulsions but showed rapid general improvement.

Jewesbury reported hydatid cysts of the pleura and lung in a boy aged 8. Diagnosis: empyema. The left chest was tapped, clear fluid with scolices being evacuated. The complement fixation test was positive. Eosinophilia 6 per cent. The X-ray demonstrated an hydatid cyst. The boy had always lived in England, and had never had intimate relationship with dogs.

Neve (India) described the case of a Mohammedan boy aged 12 with hydatid cysts in both lobes of the liver. Hooklets were demonstrated. Both cysts were treated by marsupialization and drainage. Recovery. Almost complete destruction of the liver obtained.

Germany. Wohlgemuth reported a case of multiple hydatid cysts of the liver in a girl aged 15. Operation: formolage and marsupialization. He notes that, in cases of multiple hydatid cysts of the liver,

seldom more than three obtain, and that their origin is usually due to dissemination of the component parts of the primary cyst.

Holland. De Jager reported the case of an echinococcus cyst of the lung and liver in a child aged 4; both cysts were removed at operation.

Verschoor saw a case of an hydatid cyst of the lung in a child. Eosinophilia 20 per cent; hooklets in sputum; complement fixation test positive. X-ray demonstrated an hydatid cyst in each lung. There was no history of association with dogs.

Switzerland. Curchod quoted the case of a boy, aged 15, who had twice been operated on by Roux for peritoneal echinococcosis, and who died from generalization of the disease. He also mentioned the case of Kolbe, that of a boy aged 7 with a suppurating hydatid cyst of the liver. Many necrotic daughter cysts were encountered. Operation: marsupialization.

HYDATID CYSTS IN CHILDREN IN NORTH AMERICA

Lyon's review of the subject (up to July 1, 1901) contained 5 cases of hydatid disease in children (Case 22, boy aged 10; abdominal; hydatidentérie. Case 95, girl aged 12; brain. Case 103, Icelandic girl aged 10; five cysts in the liver. Case 129, child, with many cysts in its bladder; hooklets demonstrated. Case 146, Italian boy aged 7; two large cysts of the liver containing daughter cysts). In a footnote (p. 131) he stated that Ferguson saw 3 cases in children under 8 years of age, who had been brought to Winnipeg by Icelandic immigrants. This makes 8 cases in all for North America.

Since the publication of Lyon's paper, three more case reports have appeared:

Case 1. Cheney. Italian boy aged 7; hydatid cyst of the liver; two-stage operation; recovery.

Case 2. Cheney. An Italian boy aged 10, born in Argentina, where he was intimate with dogs, had a hydatid cyst of the liver, no daughter cysts. Recovery; fistula healed very slowly.

Case 3. H. M. Young (Canada). Girl aged 9, came to Canada at the age of 2 from Southern Russia where she had contracted the disease. An hydatid cyst of the right lobe of the liver, the size of a grapefruit, and one in the quadrate lobe, the size of an orange, were found. The cysts were evacuated and packed with gauze. Both contained daughter cysts. Hooklets were demonstrated.

To these I now add three cases, which have not been previously reported.

Case 1. (Courtesy of Dr. Emmet Rixford of San Francisco, 1897.) Hydatid cyst of the liver in a boy aged 6. He had had "fever" four years before, and enlargement of the right side of the abdomen for 3½ years. At operation, April 11, 1897, an hydatid cyst of the liver containing one pint of fluid was found. Marsupialization was done. Three days later, many daughter cysts discharged with membranes. Recovery. A second cyst was discovered, evacuated, and drained; recovery. June 7, 1897, patient discharged with wound soundly healed.

This case was not included in Lyon's list:

Case 2. (Courtesy of Dr. Norman F. Sprague of Los Angeles.) Boy aged 13, born in Scotland had lived 10 years in America. At first operation in 1920, multiple cysts of omentum were resected.

At second operation, multiple cysts of liver were resected *en masse*.

At third operation, recurrences in pelvis were resected.

The result was an apparent ultimate cure. Patient is now quite well and working, with no evidence of recurrence. In this case hooklets were demonstrated; there was no eosinophilia.

Case 3. (Courtesy of Dr. Hugh K. Berkeley of Los Angeles.) Russian boy aged 7, who had lived all his life in Los Angeles. At operation (1923), a unilocular hydàtid cyst of the liver, the size of a baseball, containing 6 ounces of fluid, was found. The treatment adopted was marsupialization and drainage. Typical laminated membrane and scolices were demonstrated. The patient recovered.

Thus, the total number of cases of hydatid cysts in children for North America to date is only 14.

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AN OPERATION FOR COMPLETE PROLAPSE OF THE RECTUM[1]

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PROLAPSE of the rectum is usually defined as being any protrusion of the entire circumference of the rectum through the anus, while complete prolapse is defined as being such a condition involving all the coats of the bowel. This definition is sufficient for all practical purposes, although it does not include what seems to be described invariably as third degree prolapse. Three degrees are differentiated: (1) cases in which the mucous membrane of the anus descends with the prolapse; (2) cases in which the anal canal is not involved; (3) cases in which the inversion begins at or somewhere near the recto-sigmoid junction and does not protrude from the anus. Manifestly this last group is not included in our original definition, and rightly so, since it should be classed as sigmoidorectal intussusception rather than as rectal prolapse. Furthermore, the first and second groups would be more accurately described as types rather than as degrees of prolapse, since the distinction between them is in kind rather than in degree.

This discussion is limited to complete prolapse of the rectum in adults, and more specifically in males, since all cases treated by us according to this technique have been in men.

The etiology of rectal procidentia is somewhat obscure. Normally, the rectum is held in position by 3 types of supports. Passive supports, the first type, include the peritoneal folds reflected from the rectal walls onto the bladder or vagina and the hollow of the sacrum, the direct fibrous attachments to the prostate or vagina, the sacrum and the coccyx, and the lateral ligaments of the rectum which are attached to the pelvic fascia covering the levatores ani. To these may be added the vessels and nerves which supply it, although it seems improbable that these play much part, since it has been shown that the vessels are so tortuous that if they were straightened without tension, they would permit moderate degrees of prolapse (Todd).

The second group includes the so-called active supports, the levatores and the sphincter ani, while the third type of support is by conformation and position. The sharp, backward angulation of the rectal tube from the prostate (or vagina) to the outlet tends to throw the weight of the pelvic viscera onto the bladder (or uterus) in front, and pressure applied vertically closes the anal canal, provided the rectum be normally empty. This condition saves strain on the other supports of the rectum, just as normal anteflexion of the uterus spares its fibrous and muscular supports.

Prolapse of the rectum obviously cannot occur so long as its active and passive supports are intact. Either they must be weakened by constitutional conditions, such as wasting diseases or old age, or by prolonged strain, or they must be congenitally defective. It is significant, we think, that, although wasting diseases, old age and prolonged strain are relatively common conditions, procidentia of the rectum is quite infrequent, and we are therefore inclined to believe that while they doubtless play some part, a congenital defect is usually if not always present.

This defect may take the form of an unusually long mesorectum or mesosigmoid; we are not impressed by the effectiveness of peritoneum as a ligament. It may be faulty fascial development, a condition known to be definitely present in certain cases, as in our first. It may be an abnormally deep cul-de-sac, as suggested by Quenu and Moschcowitz, a condition which prevents the backward angulation of the rectum at the level of the prostate, since the bowel is not fixed to the prostatic capsule at all, and intra-abdominal pressure is applied directly to the anal orifice, stretching it instead of closing it as should be the case. Again, the anterior rectal wall may be pushed like an obturator through the anus.

It is of course possible that great strain, suddenly applied, might rupture the structural supports of the rectum, but in view of

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the difficulty experienced in delivering this organ through the perineum for resection, it is probable that such a catastrophe would be accompanied by pain comparable to that experienced in delivering the fetal head, and it is not recorded that sudden prolapse causes such agony. It is also true that extensive perineal lacerations are sometimes followed by prolapse of the rectum, but they are even more frequently followed by prolapse of the uterus, and we believe that few gynecologists hold that such lacerations alone produce this condition.

Numerous exciting causes may obviously be added, such as constipation, prolonged sitting at stool, faulty position at stool, prolonged diarrhœa with tenesmus, heavy lifting and stricture of the rectum or the urethra, but all are so common that it is impossible to assign to them more than a minor part in the production of rectal prolapse. It is probable that polypoid tumors and high strictures may lead to the formation of sigmoidorectal intussusception, and that this condition may in turn be converted gradually into a first or second degree rectal prolapse, but such cases are very infrequent.

Whatever be the cause of the condition, however, we have in the end to deal with an anatomical defect, as in hernia, and any method of treatment must be directed toward correction of the more or less mechanical deficiency. We are not, of course, considering such small protrusions as may be cured by non-operative measures.

THE OPERATIVE PROCEDURES IN USE

Innumerable operations have been devised for the cure of rectal prolapse, none of which has proved entirely satisfactory. To mention them briefly, they include:

1. Excision of the offending organ either totally or in part (Mikulicz, Cunningham). This method seems to have fallen gradually into disfavor. It is an illogical procedure at best, since none of the supports are restored and since further prolapse is inhibited only by the mesosigmoid. The normal motor mechanism of the rectal pouch is of course entirely destroyed, wound infection, gangrene of the gut and peritonitis are not uncommon sequelæ, and recurrence is estimated to be as high as 54 per cent, so that the technique, on the face of it, has little to commend it.

2. Suspension of the bowel within the abdomen with or without obliteration of the cul-de-sac (Moschcowitz). This method also has few advocates, which is not surprising in view of the decidedly indifferent results obtained by a similar technique in suspension of the uterus or the stomach. It must be pointed out, however, that the simultaneous obliteration of the cul-de-sac and the suspension of the rectum by pursestring sutures, beginning at the depths of the pouch, has much to recommend it. As advocated by Quenu and Moschcowitz it has the virtue of restoring the anterior fixation of the lower rectum and preventing the direct action of intra-abdominal pressure on the abnormally mobile bowel. Moschcowitz adds that relaxation of the sphincter ani and prolapse of the mucous membrane may require additional treatment. This operation is plainly based on the theory that an abnormally deep cul-de-sac is the primary cause of the prolapse, which begins as a hernia of the anterior wall of the rectum through the anus. In our opinion this theory accounts for some instances of this condition, and possibly for all of them, and, this being the case, the method is a sound one, but it is open to serious practical objections. In the first place, it is a severe and difficult operation, not suited to debilitated or aged patients, and in the second place, while it is a reasonably simple procedure in women, it is a very difficult one in men, and necessitates suture of the rectum to the bladder, a dangerous and illogical performance.

3. Fixation of the rectum to the sacrum and coccyx (Tuttle, Sick, Mummery). This procedure, usually combined with shortening of the external sphincter, is rather generally favored. Tuttle's method of scarification and suture seems rather the more popular technique, but Mummery reports great success with a modification of Sick's method. This consists in dissecting the organ free from the sacrum and packing the space until it is obliterated by granulation tissue. The result is a firm scar, which re-establishes one of the normal supports. These methods, however,

provide support only posteriorly, and do not restore either the pelvic floor or the support of conformation, so that the forces which aided in producing the original prolapse are permitted to act unchecked. Furthermore, a practical objection to Mummery's modification is that the patient must remain in bed 4 weeks, and that for 2 months defæcation must take place in the recumbent position.

4. Plication, wedge-shaped excision, excision of the mucous membrane, and similar methods designed to shorten or narrow the gut (Diffenbach, Roberts, Delorme, Duret, etc.). These methods are all obviously of value only in simple cases. In particular, resection of the mucous membrane with plication of the other coats has little or no support among English and American surgeons.

5. Plastic restoration of the pelvic supports, usually limited to narrowing the external sphincter (Duval, Lenormant, Lynch, etc.). Excision of wedges of the lower rectum are sometimes included in this technique also. The method is effective in mild cases, and forms, according to Mummery, an essential part of any operation for rectal prolapse.

We have found it difficult, indeed impossible, to form an accurate impression of the relative merits of these various procedures. Few of the authors give statistics of their results, and though each seems fairly well satisfied with his own technique, the multiplicity of operations and modifications makes it plain that the methods in use still leave much to be desired.

We have developed a plastic operation on the levatores ani and pelvic fascia, which is based on the assumption that an abnormally deep cul-de-sac, together with relaxation of the lateral ligaments, the levatores ani and the sphincter ani, is the cause of complete prolapse of the rectum. The method grew out of the idea that relaxed levatores might easily be corrected by the vaginal route and that at the same time a deep cul-de-sac might be obliterated and the rectum suspended as in operations for high and extensive rectocele, according to the technique advocated by George Gray Ward and others.

It should be noted that since we began our work, in 1922, Lynch has reported a method of plication of the lateral ligaments in front of the rectum which is quite similar in principle to the one devised by us, though applicable only to women. We might say, too, that while the operation is original with us, we have recently learned that a very similar procedure was reported by Duval and Lenormant in 1904. They reported 3 successful cases at that time, but we have been unable to find a subsequent report by them, and no one else seems to have tried the method. Bickham is the only authority consulted who even mentions it, and he gives no bibliographical reference.

DETAILS OF THE AUTHORS' PROCEDURE

With the patient in the lithotomy position the prolapse is reduced, and an inverted Y incision is made, with the arms embracing the anus. This is deepened to expose the external sphincter. The anobulbar raphe is cut across, thus freeing the sphincter from the central tendon of the perineum. The anterior quadrant of the external sphincter is now excised, and the muscle immediately sutured end to end with U sutures of chromicized gut. The incision is deepened to expose the levator ani. Its medial margins are separated by blunt dissection with scissors. With a finger or a pack in the rectum as a guide, the anterior and lateral walls of the rectum as far as the lateral ligaments are exposed. This is best done by blunt dissection with a gauze covered finger. The prostate and seminal vesicles are pushed forward. If the cul-de-sac is abnormally deep, the reflection of peritoneum from rectum to prostate will now be encountered and should be carefully pushed up until the prostate is exposed in front, and the adventitia of the rectum, as far as the finger will reach, behind. The superior surface of the levator ani, covered by the pelvic fascia, now forms the lateral wall of the space. Beginning at the apex of this artificial vagina, sutures are introduced to approximate the levatores and suspend the rectum. Chromicized catgut on full curved, round needles is used. A deep bite is taken in the levator and fascia on the right, the needle is then carried down an inch or an inch and a half, and several transverse stitches are taken across the lateral and anterior as-

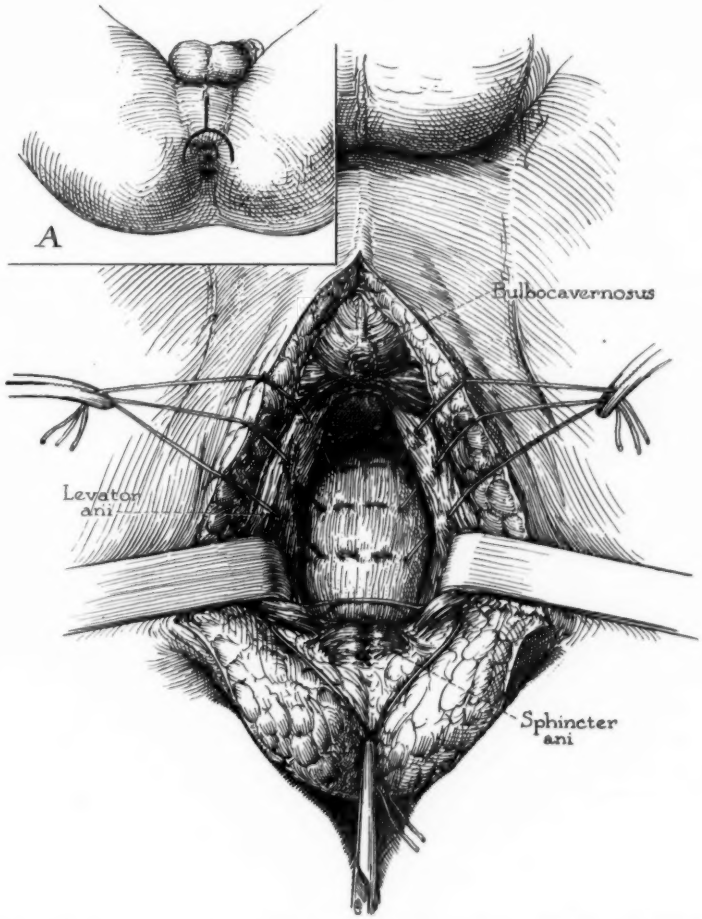

Fig. 1. The anatomy of the operative field and the method of applying the sutures.

pects of the rectal walls. From this point the needle is carried up to a point on the left levator, corresponding to the first bite on the right, and a similar stitch is taken here. Three or 4 sutures of the same type are inserted at short intervals until the free margins of the levatores are reached. Each of these sutures, when tied, approximates the levatores ani, suspends and plicates the rectum, and closes the depth of the cul-de-sac. A last suture approximates the free margins of the levatores but does not pick up the rectum. This permits the anus to be thrown backward, reproducing the normal backward angulation of the anal canal. The effectiveness of this feature is illustrated in Case 2, in which, although the sphincter was absent, a fair degree of control of solid fæces was obtained.

When relaxation of the pelvic floor is extreme, it may be necessary to supplement this procedure by fixing the posterior wall of the rectum, according to the method of Tuttle. Mucous membrane prolapse may mar an otherwise perfect result, as in our third case, but this may be easily corrected by linear cauterization or excision.

We might add that the operation is not difficult, that it produces practically no shock, and that it is quite practicable with spinal or local anæsthesia.

The number of our cases, 3, is of course too small to permit of conclusions. We have delayed this report in the hope of adding to their number, but without success, and we therefore present it now in the hope that others may try the method and demonstrate its merits or its faults

CASE REPORTS

CASE 1. F. F., white, aged 60, grocer, was admitted August 29, 1922, complaining of piles, rupture, and sore on thigh. The past history was irrelevant except for osteomyelitis of the lower third of the right femur 20 years ago, which had never healed. Left inguinal scrotal hernia had been present for 8 years, piles for 2 years. Physical examination revealed an obese man, looking much older than the 60 years he claimed as his age. He appeared quite sick and very feeble. A systolic murmur at the apex of the heart and moderate enlargement were noted. Œdema of the feet and dyspnœa seemed to indicate failing compensation. There was a large, reducible scrotal hernia on the left. The rectum protruded 3 or 4 inches and was quite red and œdematous. The mucous membrane was gangrenous at the center. Urinalysis showed many casts but no albumin. Other laboratory examinations were negative.

Elevation of the hips and hot, moist applications led to subsidence of the œdema and separation of the sloughs of mucous membrane. After a week of this treatment the prolapse could be reduced, but would not remain so, even with the hips elevated. The external sphincter was completely relaxed, and the perineum was convex downward instead of concave, a condition which suggested the idea of reenforcing the relaxed levatores.

Three months later, when the patient had gained sufficient strength to permit of surgical intervention, under spinal anæsthesia, the operation described above was performed except that the rectum was not included in the sutures.

Convalescence was uneventful, but the patient's general condition was so poor that he was kept in the hospital until February 24, 1923. He was then discharged with instructions to return at intervals for examination; he failed to do this and we have been unable to trace him.

At the time of his discharge a slight mucous membrane prolapse persisted, but this first attempt was fairly satisfactory, in spite of our failure to suspend the rectum. It was, however, an incomplete operation, and in view of the extreme muscular relaxation of the perineum we strongly suspect that the posterior half of the rectum did not remain in position.

CASE 2. C. D., colored male, aged 29, laborer, was admitted September 6, 1923, complaining of incontinence of fæces and protrusion of rectum. The past history was mainly irrelevant except that the right leg had been amputated because of an injury with infection the previous year. There was no history of constipation. The present illness began 5 years ago, with protrusion of the lower bowel during defæcation. The first operation was performed the following day, which suggests that the prolapse must have been quite extensive, as negroes do not ordinarily seek hospital treatment for minor ailments. Within 5 years he had had 3 operations for this condition, each time being hospitalized from 2 to 15 months. Two of these operations were said to have been for hæmorrhoids, the third was definitely a rectal affair, but he knew nothing of the details. Incontinence developed after the second operation, and the condition had grown steadily worse.

Physical examination revealed the rectum protruding about 3 inches and easily reducible. The anus gaped widely and there was no evidence of sphincter action, voluntary or reflex. An irregular scar, particularly dense in front, surrounded the anus.

Operation was performed September 13, 1923, under ether anæsthesia. The procedure described was performed without incident, except that the density of the scar anteriorly made exposure of the lower margins of the levatores quite difficult. No trace of the external sphincter could be found.

Convalescence was uneventful except for a slight skin infection at the anal margin. The patient was allowed up on the fifteenth day and discharged fit for duty on the thirty-third day. At the time of discharge there was not the slightest tendency to prolapse, even on straining. Sphincter action was entirely absent, but the patient was able to tell when the bowels were ready to move in sufficient time to reach a toilet. If the stool was solid, an effort was required to evacuate the rectum. No follow-up was obtainable.

CASE 3. G. W., white male, aged 42, clerk, was admitted May 7, 1924, complaining of piles. The previous history was negative. Piles for 5 years, relieved by operation. In March of this year, while on a drinking party, he suddenly developed a painful protrusion of the rectum, which was gradually reducible but would recur at stool and after any exertion. It had grown progressively worse, and at the present time was reducible only in the recumbent posture. There was constant soiling of the clothing.

Physical examination revealed nothing except a first degree prolapse of the rectum of about 2 inches, and a relaxed sphincter.

Operation as described was performed May 12, 1924. Convalescence was uneventful, except that after the second day the patient could not be kept in bed and sat up in a chair most of the time. In spite of this the prolapse was entirely corrected when he was discharged on the fourteenth day after operation. Further hospitalization seemed useless as he persisted in defying orders.

He was re-admitted for examination 6 months afterward. A slight eversion of mucous membrane was present, not more than a quarter of an inch, but there was no evidence of prolapse and the sphincter control was normal. In May of this year he was examined at the office, at which time there was a mucous prolapse of about an inch, which was quite œdematous. The rectal wall was firmly fixed. November 19, 1925, he returned, complaining of a recurrence of the original condition. Careful examination showed that the posterior semicircle of the rectum had prolapsed about an inch (not nearly so much as originally), and that the anterior portion was so firmly fixed in position that the gauze covered finger could not produce eversion of even the mucous membrane. Posterior fixation will be done later, and we believe should be done in every case, no matter what the type of prolapse.

In addition to these cases we are able to add one more, a woman, through the courtesy of Dr. J. deJ. Pemberton of the Mayo Clinic. The operation was done at the suggestion of one of us (Maes), and the report, 5 months after operation, is that the results are perfect. Posterior fixation was done in this instance.

It will be readily seen that this operation has evolved gradually and that the results have not been ideal. We believe, however, that we have discovered and corrected its weaknesses, and that as it stands today it offers a satisfactory technique for all cases of rectal prolapse in which complications do not exist and in which the condition is not extreme.

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THE TREATMENT OF PELVIC INFECTIONS

With an Analysis of 1,105 Cases

By THOMAS H. CHERRY, M.D., F.A.C.S., New York City

DURING the past 8 years 40 per cent of the patients admitted to the Gynecological Division of Harlem Hospital, New York City, have had some variety of adnexal infection. There were 1,105 cases of adnexal disease, and these form the basis for the clinical study herein submitted.

It is not the purpose of this paper to offer anything new in the way of conservative or surgical treatment, but solely to analyze and record the treatment and clinical end-results.

These cases can be divided into the gonorrhœal and non-gonorrhœal. In this series of cases of adnexal disease approximately 88 per cent are regarded as gonorrhœal in origin, 12 per cent non-gonorrhœal. In the latter group the condition was due to infections following birth trauma, secondary infections associated with other pelvic pathological changes, and in a small number, to tuberculosis.

Attempts to classify these groups more accurately by prevailing laboratory methods were unsuccessful. In the presence of urethral and cervical discharges, only 12 per cent of smears demonstrated the gonococcus. Cultural methods also proved disappointing. Complement fixation tests from the blood were not only valueless but in some instances were even misleading. Intradermal injections of specific bacterial proteins were tested and seemed devoid of diagnostic significance (3).

As the gonococcus has a predilection for mucous membrane, and the site of the primary infections is the urethra or cervix, one can classify adnexal disease as gonorrhœal: (1) when smears from the urethra or cervix show the presence of gram-negative intracellular diplococci; (2) when in spite of negative smears there is observed an endocervicitis with a urethritis, skenitis, or bartholonitis; and (3) when there is adnexal infection with infections of the above anatomical sites, the smears from which show a preponderance of pus cells.

While these clinical observations are not scientifically accurate criteria for the diagnosis of the etiological factors in genital tract infections, they may be relied upon until more improved biochemical methods have been devised.

Patients having adnexal disease sought admission to the hospital for relief of abdominopelvic pain. They were usually seen in the acute stage of pelvic inflammation, whether suffering from an initial attack or an exacerbation of a chronic condition. Examination of these patients disclosed the presence of a vaginal discharge, either from a concomitant urethritis or endocervical infection. The adnexa were tender and enlarged. The temperature varied from 100 to 104 degrees F.

During this period conservative measures only were applied. Sedatives were given to ameliorate pain; ice bags were applied to the abdomen, and hot vaginal douches prescribed, to aid nature in the control of the infection. Local treatments were given for the urethritis and endocervicitis. In the event of a suburethral or Bartholin abscess, the pus was evacuated by incision and drainage.

Certain groups of these patients were selected at different times to test various forms of the newer therapeutic measures, such as intramuscular injections of milk preparation, normal horse serum, and medical diathermy.

The principles upon which the theory of non-specific foreign protein therapy is based will not be discussed. A group of 25 patients having acute adnexal infections with readily demonstrable pelvic lesions were given a sterile lactalbumin preparation (aolan). This was administered by intramuscular injections in 10 cubic centimeter doses, as recommended by Heinemann (6). The subsequent temperature, leucocyte counts, and clinical symptoms were carefully observed. No general reaction followed in any instance. The leucocyte count showed an increase in 4 patients,

Fig. 1. Showing an initial gonorrhœal salpingitis. *A*, Inflamed tubes; *B*, ovaries; *C*, fimbriated end from which purulent material is exuding.

Fig. 2. Illustrating complicated lesions following recurrent attacks of pelvic inflammation.

the lowest 4,000 and the highest 7,000, 12 hours later. The other 21 patients showed either no increase or a slight reduction in the existing leucocytosis.

In no case treated with this preparation was there any relief of pain, reduction of the pelvic inflammation, or diminution of the vaginal discharge.

Foreign protein in the form of normal horse serum was administered to another group of 15 patients with similar pathology. This serum was injected subcutaneously in 40 cubic centimeter doses after a previous cutaneous test had been made to ascertain the susceptibility to anaphylaxis. A marked general reaction followed in 50 per cent of these patients, with rise of temperature and the typical skin eruption of "serum sickness." When the reaction subsided these patients showed a beginning resolution of the pelvic infection, reduction of pain and tenderness, a decrease, and in some cases, complete cessation of the vaginal discharge. Because of severe reactions in 2 cases, as manifested by extreme illness from the injections, and because of no improvement in the pelvic infection unless a reaction was obtained, the use of this therapy was discontinued. The risk involved and the lack of uniform results from its employment did not warrant its continued use.

Diathermy, as a therapeutic agent, has yielded definite results when applied to pelvic infections of gonorrhœal origin. The penetration of the pelvic structures by an electrical high frequency current through properly placed electrodes generates heat in the tissues to varying degrees. The intensity of the heat can be controlled by the size of the electrodes and the amount of current utilized, measured in milliampères. It is an established fact that the gonococcus is susceptible to comparatively low degrees of heat. An exposure to 42 degrees C. for 10 minutes will destroy it completely. By the use of diathermy, a temperature of 45 degrees C. can be generated in pelvic structures without discomfort to the patient or damage to the tissues; destruction of the gonococcus is thereby assured. By means of experimental work upon rats and dogs, I have demonstrated that skin, subcutaneous tissue, bone, and the internal pelvic

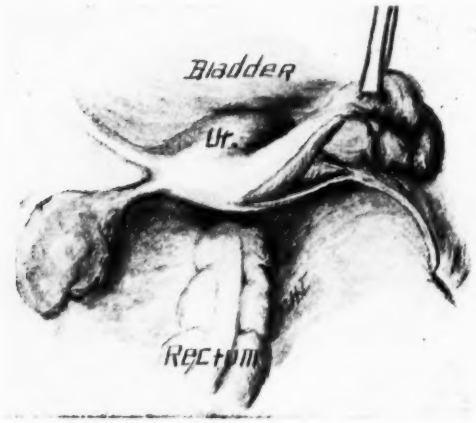

Fig. 3. First step in a fundal hysterectomy with removal of both adnexa.

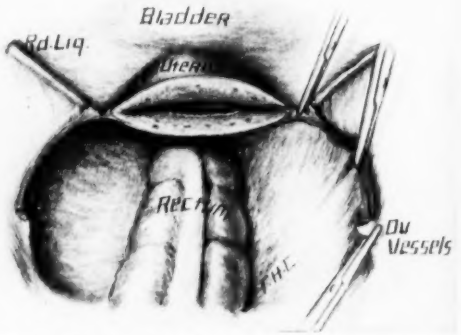

Fig. 4. Drawing showing pelvic structures and fundus of uterus removed.

organs will withstand a temperature of 50 degrees C. without morphological changes.

In a previous article (1) a report was made of 52 patients with adnexal disease to whom diathermy had been applied. The treatments were administered by means of vaginal or rectal electrodes, with an inactive electrode upon the abdomen or sacral region. In some instances a sacro-abdominal application was made. The number of milliampères used varied from 2,000 to 3,000, but in all cases sufficient current was utilized to raise the vaginal temperature to 43 or 45 degrees C. for 25 to 35 minutes.

Gratifying results followed, the immediate cessation of pain being particularly impressive. In 36 patients whose pelvic lesions consisted of tender and painful masses there was complete resolution of the masses in 12; and a marked reduction in size in another 12.

In 12 additional patients, however, the masses were apparently unaffected and not reduced in size, although there was a decrease in body temperature and relief of abdominal pain. It is interesting to note that when 8 of these patients were operated upon, large pus tubes or tubo-ovarian abscesses were removed more easily than usual; adhesions seemed softer, more hyperæmic, and were easily separated by blunt dissection; the masses themselves appeared softer, were œdematous, and readily delivered without rupture. The inflammatory products consisted of a thin, watery, straw-colored material, instead of the thick, creamy, purulent material usually encountered. All cultures from these masses were sterile. Convalescence in these cases was remarkably smooth, all wounds healing by primary union.

In postpartum and postabortum adnexal infections, the application of diathermy was not as successful as in those of gonorrhœal origin. The pain was only temporarily relieved and then recurred. In one case of a fresh post-abortum infection, a generalized peritonitis was aggravated and death followed. Another patient having a postpartum infection of the adnexa, to whom diathermy was given, showed a spreading pelvic peritonitis with abscess formation, necessitating evacuation and drainage.

The bacteria most active in postpartum infections are the streptococcus, staphylococcus, and colon bacillus. To destroy these micro-organisms 58 to 60 degrees C. of heat are essential, but since such temperature coagulates tissue, the use of diathermy is precluded in most cases of this type of pelvic infection.

Two hundred and eighteen patients having adnexal disease were treated conservatively and not operated upon. After the acute symptoms had subsided the endocervicitis was treated to prevent a re-infection of the adnexa. This consisted of cauterization of the canal in some cases, electro-coagulation in some, and the application of dyes in others. The urethra and Skene's ducts were treated by topical

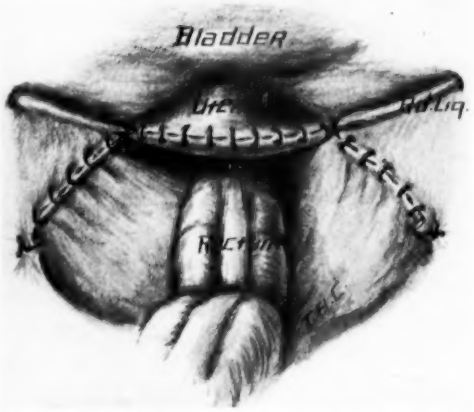

Fig. 5. Round ligaments have been implanted and broad ligaments and fundus uteri sutured.

applications as well as by the use of the Corbus thermophore in the urethra. Abdominal operations were performed upon 832 patients whose history or physical findings indicated recurrent adnexal inflammation. Fifty-four patients who had concomitant pelvic abscesses with tubal infection were drained through the vagina; 3 deaths occurred; a mortality of 5.5 per cent.

In the entire series of 887 operative cases there were 44 deaths; a mortality of 4.6 per cent.

When patients with an initial attack of acute salpingitis were admitted they were treated by the conservative measures already outlined. Resolution, as a rule, occurred, and in some instances the tubal lumen apparently became re-established. This was particularly true if it was possible to free the lower genital tract of infection. A few cases of this type were operated upon in the presence of pronounced right-sided pain; they were mistaken for cases of appendicitis. Under such circumstances the adnexa were not disturbed and the abdomen was closed.

During an exacerbation of a recurrent chronic infection surgical interference was performed only when there was evidence that the infection was spreading beyond the pelvis and producing a generalized peritonitis. Spontaneous rupture of a pyosalpinx or tubo-ovarian abscess occurs infrequently; but when

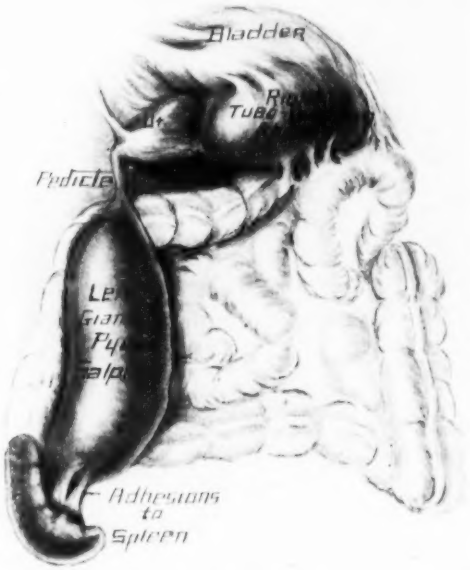

Fig. 6. Giant pyosalpinx of left side adherent to hilum of spleen. Tubo-ovarian abscess present in right side.

such an accident does occur generalized peritonitis develops and operative interference should not be delayed.

When a pelvic abscess forms, drainage by the vaginal route is established, and laparotomy is deferred until a later date.

The abdomen was opened in the presence of acute symptoms 81 times. When there was definite evidence that a chronic infection was present, the pathological masses were removed if feasible; otherwise proper drainage only was established.

The chronic cases of adnexal infection presented interesting variations in pathology. Some showed slightly thickened tubes, the fimbriated ends of which were or were not occluded; adhesions were few in some instances, in others dense. Some tubes were greatly thickened and fibrosed and densely adherent to surrounding pelvic structures; most contained a purulent exudate of varying consistency that, as a rule, proved sterile. The tubes were often much enlarged, containing thick, creamy pus; communications between the pyosalpinx and ovary, forming tubo-ovarian

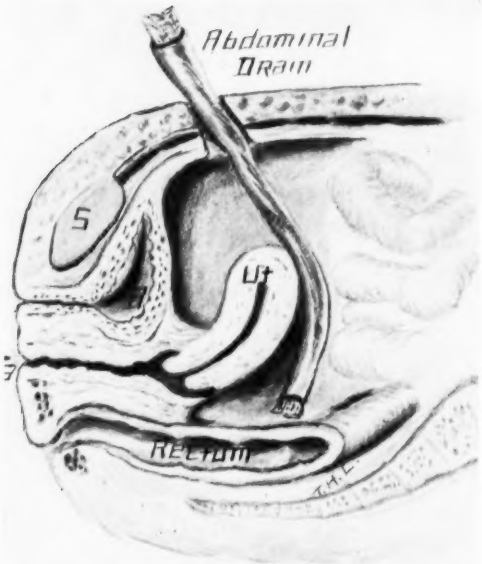

Fig. 7. Cigarette drain inserted through lower angle of abdominal wound down to cul-de-sac.

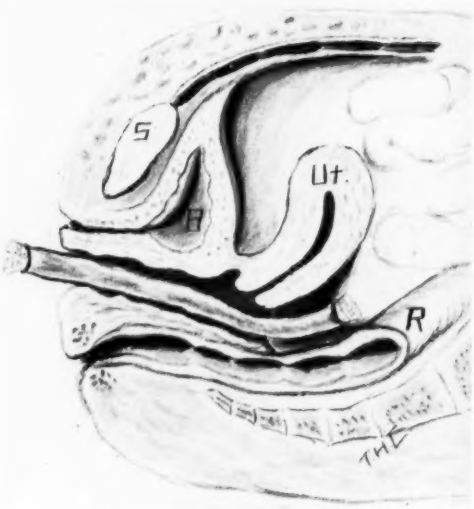

Fig. 8. Cigarette drain through vaginal vault into cul-de-sac.

abscesses or cysts, were not uncommon. Infective processes may take place in the ovaries, presenting a simple ovaritis, retention cysts, or abscesses.

In this same group there were 806 patients operated upon, for tubo-ovarian abscess or cyst, 144 cases; pyosalpinx, 386; and thickened adnexa with peritubo-ovarian adhesions, 276. Incidental pathological changes noted were cystic ovary in 118; ovarian cyst in 61; tubal pregnancy in 8; hydrosalpinx in 16; intraligamentous cyst in 1; papillary cyst adenoma of the ovary in 1; ovarian cyst-adenocarcinoma in 1; fibromyoma in 85; appendicitis in 83; retrodisplacements of the uterus in 102.

These patients presented clinical evidence of a recurrence of pelvic infection, either acute or subacute. Abdomino-pelvic pain was a pronounced symptom; temperature ranged from 100 to 104 degrees F.; leucocyte counts varied from 8,000 to 30,000, depending upon the severity of the infection and the patient's resistance. Practically all had an endocervicitis with a mucopurulent vaginal discharge. Many had urethritis, skenitis, and bartholinitis. During the acute stage conservative therapeutic measures were instituted until it subsided, as shown by normal temperature, pulse rate, lowering of leucocyte count, and amelioration of pain.

Early operation has been adopted as a wise policy by the personnel of the Gynecological Department of Harlem Hospital following subsidence of the acute exacerbation. It has been considered safe to operate when the patient's temperature has been normal from 3 to 10 days, and the leucocyte count is below 16,000.

In 508 patients operated upon whose recorded leucocytosis was below 16,000, there were 21 deaths, or 4.1 per cent mortality. Among 120 patients with a leucocytosis above 16,000 there were 20 deaths, or 16.6 per cent mortality. These observations demonstrated the value of the leucocyte count as an indicator of the reaction or acquired immunity of the patient to the pelvic infection.

European Clinics place great dependence upon the sedimentation time of the red blood cells as a more reliable indicator of the activity of infection.

Linzenmeier (8) believes that a sedimentation time of below 30 minutes indicates an

active infective process and that one of 60 minutes, or less, suggests a latent infection. Friedlander (5) prefers not to operate upon pelvic infections until the sedimentation time is well above 60 minutes. In a previous article (2) the writer presented a comparison of the relative value of the leucocyte count and sedimentation time of the erythrocytes in a group of 71 patients operated upon for adnexal disease. Twenty-nine patients of this group showed a sedimentation time of less than 30 minutes, but their average leucocyte count was 13,250. There was no mortality, and the morbidity averaged 18.2 days. Twenty-six patients showed a sedimentation time of between 30 and 60 minutes, with an average leucocyte count of 10,200. There were no deaths, and the morbidity averaged 16 days. The rest of the group, 16 patients, had a sedimentation time above 60 minutes, with an average leucocyte count of 10,200. One death occurred in this group from a general peritonitis with the sedimentation time of 68 minutes.

From these comparative results, as well as from other isolated instances, one cannot help but believe that in estimating the activity of an infective process greater reliance should be placed upon the white cell count than upon the sedimentation of the red cells.

At operation, I first dispose of the endocervicitis either by performing a trachelo-plastic operation or by thoroughly cauterizing the endocervical mucosa. The abdomen is then opened and the tubo-ovarian masses removed. No attempt is made to salvage portions of damaged ovaries or tubes. In previous years such attempts at conservation were frequently made with disappointing results. In 10 such instances it was necessary to evacuate secondary abscess formations by colpotomy.

In patients with extensively involved adnexa, a fundal or supravaginal hysterectomy was done in order to extirpate all infective foci. This operative maneuver was performed 159 times. When ovaries appeared normal they were suspended to the fundus uteri by shortening the utero-ovarian ligament. The ovaries were conserved in 401 cases.

In many instances upon removal of both tubes with retention of one or both ovaries,

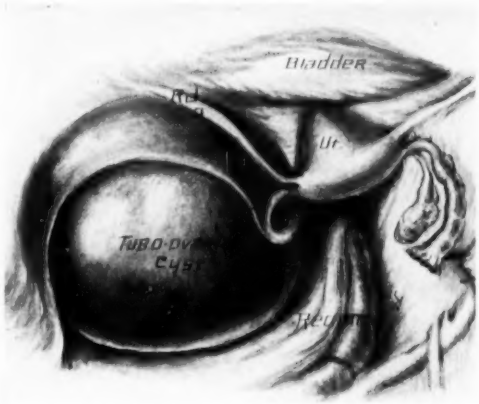

Fig. 9. Large tubo-ovarian cyst simulating intraligamentous mass.

the uterus was suspended either by a fixation suture or shortening of the round ligaments. This was done to prevent a postoperative retrodisplacement, which will otherwise occur in 70 per cent of cases.

In the separation of adhesions care was taken to prevent injury to the intestinal walls. The judicious use of sharp dissection, where blunt separation seemed harmful, prevented many such injuries. In some instances portions of the inflammatory masses were cut away and allowed to remain attached to the gut wall rather than risk perforation. In spite of this extreme care in technique, accidental intestinal opening occurred 12 times; 5 times in the sigmoid; and 7 times in the small intestines. Resection was necessary in 1 case; otherwise single suture sufficed. No deaths occurred from injury to the large gut, but 4 patients died from the injuries to the small gut, a mortality of 33⅓ per cent.

Among the 833 abdominal sections for adnexal disease, pus was encountered and the peritoneal cavity was soiled 324 times. When such an accident happens, the question of whether or not to institute drainage is naturally foremost in the mind of the surgeon. To determine which pus cases require drainage many things must be taken into consideration. Practically speaking, all these adnexal infections originated as gonorrhœal inflammation. The chronicity and subsequent acute

exacerbations were due either to a fresh infection of another gonococcal strain or a recrudescence of the original one. Occasionally the acute exacerbations were due to the invasion of the field by other pyogenic bacteria, which also may persist as a low grade inflammatory process producing great damage to the pelvic organs; however, in the course of time the resistance of the tissues overcomes these invading germs and an immunity is established. The pus in most instances becomes free of bacteria. It is true that the tissues of the tubal wall may harbor these bacteria, as shown by Curtis (4) in tissue cultures, but an immunity to this has also been attained and they are usually quiescent and not virulent.

The introduction of a drain into the peritoneal cavity, either through the abdominal wound or vaginal vault, produces a peritoneal irritation that, according to Hertzler (7), surrounds it with adhesions sufficient to exclude it from the peritoneal cavity. At the end of 48 hours these adhesions are fairly firm and the drain has accomplished its purpose in establishing a communication for the escape of infective material; therefore, on the third postoperative day the drain should be gradually withdrawn and shortened and by the seventh day it should be entirely removed. Instances occur when the advisability of establishing drainage is questionable. The old slogan, "When in doubt, drain," might be paraphrased to read, "When in doubt, drain, but don't drain long." Under these conditions the drain should be removed by the fourth or fifth day. When infection has not taken place, the communicating sinus will close more quickly.

In my opinion it is not necessary to drain the pelvis in pus cases when a smear shows the absence of bacteria, when the temperature has remained normal for a period of from 3 to 10 days, and the leucocyte count is below 16,000.

A guide to the infectivity of pus in the 324 contaminated cases is well illustrated by the mortality of 4 per cent in those patients whose leucocyte count was under 16,000; while a mortality of 20 per cent occurred in those patients whose leucocyte count was above 16,000.

The most logical site for the establishment of drainage in pelvic surgery seems to be through the vaginal vault rather than through the abdominal wound. Occasions frequently arise, however, that necessitate, for the sake of speed, the latter course. Drains were also inserted for hæmostasis, when persistently oozing areas could not be controlled otherwise. Drainage was established 163 times; 126 times in the presence of pus contamination, and 37 times for bloody oozing.

It is interesting to note that in the contaminated series, when no drainage was used, the mortality rate was 3.8 per cent and primary union occurred in 79.6 per cent of the cases. When abdominal drainage was instituted the mortality was 14.3 per cent with primary union in 18.3 per cent of the cases. When vaginal drains were inserted the mortality was 10.2 per cent and primary union occurred in 63.2 per cent of cases.

In the entire series of 578 cases in which drainage was not employed, 18 patients died, a mortality of 3.1 per cent; of 125 patients with abdominal drainage, 19 died, a mortality of 15.2 per cent; of 38 patients with vaginal drainage, 4 died, a mortality of 10.1 per cent.

It would seem from these statistics that when pus is encountered in pelvic infections, no drainage yields the best results, and when the operator decides that drainage is necessary the vaginal route is better than the abdominal.

CONCLUSIONS

1. In 1,105 cases of pelvic infections in the Harlem Hospital, New York City, the gonococcus is the inciting agent in 88 per cent, and in 12 per cent the condition is due to other causes.

2. Exclusively conservative treatment of adnexal disease is, on the whole, unsatisfactory. The patient upon discharge from the hospital is inclined to ignore the advice given urging return visits, and re-infection of the adnexa often occurs.

3. Injections of foreign protein in the form of milk preparations (aolan) and horse serum have proved unsatisfactory.

4. The use of diathermy as a conservative measure in the treatment of adnexal disease of gonorrhœal origin was the most successful of

the palliative methods, as it caused a resolution of pelvic masses in 66.6 per cent of patients, besides relieving pain in practically 100 per cent. It also, by proper application of electrodes, controlled the infection of the lower genital tract.

5. Initial acute attacks of adnexal inflammation should not be treated surgically, as they spontaneously subside. Re-infection should not occur if the lower genital tract is properly treated.

6. Recurrent attacks of pelvic inflammation are excellent reasons for the surgical removal of the pelvic lesions. Such surgical procedures can be performed with a reasonable assurance of not more than a 3 per cent operative mortality, if the temperature has remained normal for 3 to 10 days and the leucocyte count is below 16,000.

7. When in the course of operative removal of infected adnexa, pus contaminates the peritoneal cavity, the best results as to mortality and wound union are obtained by closure of the abdomen without drainage. If drainage is necessary the vaginal route is better than the abdominal.

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RESULTS OF HYPOGLOSSOFACIAL ANASTOMOSIS FOR FACIAL PARALYSIS IN TWO CASES[1]

By ALFRED BROWN, M.D., Omaha, Nebraska

THE operation of anastomosis between hypoglossal and facial nerves for the relief of facial paralysis was first performed by Koerte (5) in 1901 and described by him in 1903. Since that time reports have appeared sporadically in the literature but the operation does not seem to have received the attention that its results would merit. From the standpoint of physiology the procedure appears to be the one that would offer the best results, as aside from the restoration of nerve continuity the question of restoration of psychic control must be considered. Frazier and Spiller (2) divide the desiderata in facial nerve recovery into three main classes. First the restoration of normal contour to the face during rest; second the restoration of voluntary motion in the muscles; and, the third, the restoration of emotional expression. The third division is the result mostly to be sought for, and because of the close relation between the cortical centers of the hypoglossal and facial nerves as illustrated by Gibson (3), an anastomosis between facial and hypoglossal nerves would seem to offer the best therapeutic results. (See Figs. 1, 2, and 3.)

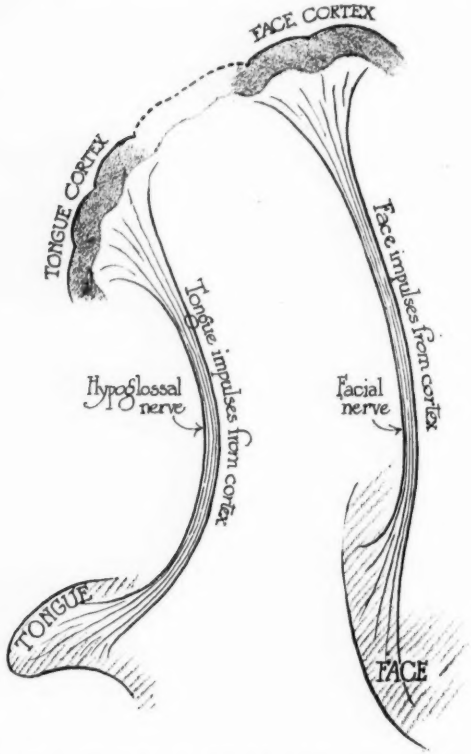

Fig. 1. Normal path of facial and lingual cortical impulses. (After Gibson.)

The operation itself, though slow and tedious is not particularly difficult if the anatomy of the parts is kept in mind, especially the fact that the facial nerve is situated deeply, at least an inch beneath the skin. The best guide to the facial, as noted by Coleman (1), is the small branch which it gives off to the posterior belly of the digastric muscle. Division of the tip of the mastoid process to turn back the anterior margin of the sternomastoid muscle as suggested by Halstead (4) is not always necessary and was not done in the first of the two cases. The hypoglossal nerve can be brought up to the facial with less tension by passing it in front of the digastric (see Figs. 4 and 5) rather than behind it as shown by Gibson. In both of these cases the descendens hypoglossi was divided, and its central end sutured to the peripheral end of the divided hypoglossal (see Fig. 6). The result in each case could be classified as fair only. The paralysis of the tongue was not a particularly serious matter, and a certain amount of this paralysis still remains.

The regeneration of nerve to the tongue does not seem to compare with that of the facial nerve.

The operation itself is only the beginning of the treatment and this fact must be impressed on the patient in such a way as to avoid any subsequent disappointment that results are

[1] Read before the Western Surgical Association, Wichita, Kansas, December 18, 1925.

slow in showing themselves. Complete cooperation is essential. Massage of the facial muscles is instituted once a day beginning 10 days after operation and a small faradic battery is used twice a day, one electrode being held in the hand and the other placed just below the lobe of the ear. In about 60 days the patient senses the fact that the face "feels different," and, as the first patient expressed it, "seems to be more alive than before and not so flabby." A little later a twitch is felt in the muscles in front of the ear when the current is turned on. In 90 days this twitch can be brought about voluntarily by asking the patient to move the tongue from side to side in the mouth and press it against the lingual surface of the teeth. From that time on the patient should practice facial movements in front of a mirror, always keeping within the limit of muscle fatigue. When improvement ceases cannot as yet be told. The first patient writes, 19 months after operation, that she is still improving. The amount of restoration of emotional expression seems to depend on two factors: first, faithful practice; and, second, the mentality of the patient.

CASE REPORTS

CASE 1. Mrs. S., age 43 years, was referred by Drs. W. F. Callfas and J. B. Potts on March 8, 1924. Three years and 4 months before this time, November, 1920, she was operated upon for sarcoma of the middle ear on the left side. Following the operation the left side of her face was paralyzed for 9 weeks and subsequently she recovered completely. Two years and 7 months ago the ear was cauterized with carbolic acid and a small dose of radium administered. This was again followed by facial paralysis. She was beginning to recover when she had a recurrence of the original growth. This was again curetted out, and in November, 1921, 60 milligrams of radium was inserted in the middle ear and allowed to remain for 18 hours. Three weeks later the facial muscles began to lose their power and since that

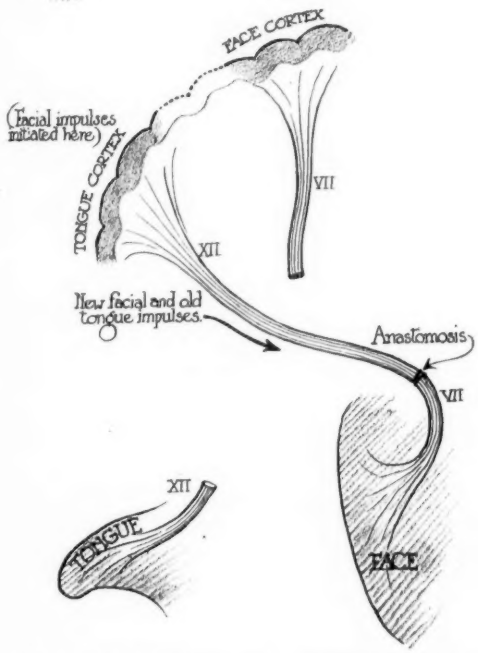

Fig. 2. Path of impulses if facial cortex ceases to function directly. (After Gibson.)

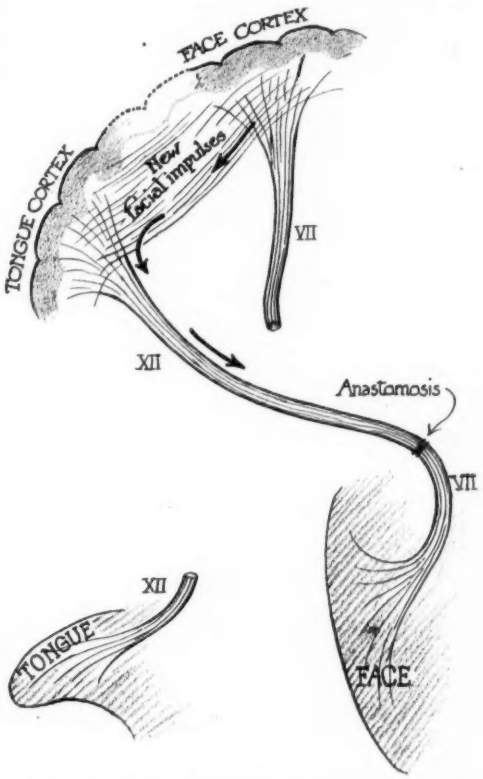

Fig. 3. Path of impulses if facial cortex functions through hypoglossal cortex. (After Gibson.)

Fig. 4. Wound laid open. Facial, hypoglossal, and descendens hypoglossi located and dissected clear.

Fig. 5. Facial and hypoglossal nerves have been divided. The posterior belly of the digastric muscle is retracted and the hypoglossal nerve drawn upward and sutured to the facial.

Fig. 6. The descendens hypoglossi has been divided and its proximal stump sutured to the cut end of the distal stump of the hypoglossal. This was done in 2 cases with only a fair degree of success.

time complete paralysis has developed and is now present. Four days ago a small sequestrum was removed from the mastoid and on examination proved to be non-malignant.

The physical examination was negative except for the wound in the region of the middle ear and mastoid which was partially healed and the facial paralysis which was absolute. There was no motion of

Fig. 8. Photograph of same patient as shown in Figures 7, 9, and 10, September 15, 1924, 5 months and 5 days after operation.

Fig. 7. Case 1, March 8, 1924, showing face in repose, patient attempting to close eyes, trying to whistle, and attempting to show teeth.

Fig. 9. Case 1, January 19, 1925, 10 months and 24 days after operation, showing face in repose, patient attempting to close eyes, trying to whistle, and attempting to show teeth.

Fig. 10. Case 1, August 12, 1925, 17 months after operation, showing face in repose, patient attempting to close eyes, trying to whistle, and attempting to show teeth.

Fig. 11. Case 2, on admission, March, 1925, showing face in repose, patient attempting to close eyes, trying to whistle, and attempting to show teeth.

any of the muscles of the affected side and in addition the reaction of degeneration was present. The peculiar apparent lengthening of the affected side which is characteristic of long standing cases of facial paralysis was marked (see Fig. 7). Though the patient was unable to close the eyelids voluntarily, it was interesting to note that they closed completely during sleep. The eye itself was normal except for a peculiar staring look and some excess lachrymation. The patient has been very careful of the care of the eye and thus has escaped any disagreeable symptoms.

In spite of the long duration of the paralysis an operation was performed on March 12, 1924, and an anastomosis between the proximal end of the hypoglossal and the distal end of the facial nerves was made using very fine silk sutures which passed through the sheath of the nerve only. An anastomosis was also made between the proximal stump of the descendens hypoglossi and the distal stump of the hypoglossal nerves. Because of the thickening of the tissues due to the radium the dissection was somewhat difficult. Postoperative recovery was uneventful except for a complaint of swelling of the left side of the throat and soft palate which lasted for a few days. The wound healed by primary union, and the patient left the hospital in 10 days. The paralysis of the tongue proved a little troublesome in eating for a few weeks but is at present not noticeable.

Massage and faradic electricity were begun and the patient returned home to Texas after being instructed in the technique of their use. In June she writes: "On about May 4, I began to notice a deep pulsation of the nerve when I used the battery. This gradually increased and on May 25 I noticed an outward pulsation near the ear. Since then this pulsation has continued when the battery is used . . . the left side seems less tense and tight than it did." The first voluntary motion occurred when she tried to move her tongue against her teeth and from that time on improvement has been continuous (see Figs. 8 and 9).

The last photographs were taken on August 12, 1925 (Fig. 10), 17 months after operation, and a month later she writes: "Mr. S. says there is a slow gradual improvement in the movement of my mouth. I can feel that the lower left corner feels less tight."

Case 2. Miss W. W., age 19 years, was referred by Dr. W. F. Callfas on March 14, 1925 (see Fig. 11). She gave a history of having had a running ear on the left side for 13 years. In September, 1923, she began taking treatments for this but without benefit. In February, 1924, she was operated upon for left mastoid disease. Two days after the operation she noticed weakness of the left side of her face which increased to complete paralysis, and there has been no return of function. Physical examination is negative except for a completely healed mastoid wound and the facial condition. There is complete paralysis of the muscles controlled by that portion of the facial nerve which supplies the lips and the lower part of the face. There appears to be slight motion of the eyelids on the left side, but no motion of the left side of the forehead.

At operation on March 16, 1925, a double nerve anastomosis was performed. The technique was essentially the same as that used in the previous case except that the tip of the mastoid process was chiselled through and turned back in order to give sufficient exposure. The facial nerve did not seem appreciably changed either in form or consistence although it appeared to be a little smaller than the normal. On stimulation of the nerve there is a slight response in the muscles of the eyelids but the remainder of the face continues to be completely motionless.

Convalescence was uneventful and the wound healed by primary union. Ten days after operation she was permitted to return home after being instructed in the use of massage and electricity. April 13, the tongue is recovering. She eats and talks better. There is no motion of the face. May 25, there appears to be slight motion returning in the lower lip. The eyelids close better. June 22, a letter says: "I am beginning to notice a change in my face. For

Fig. 12. Case 2, September 17, 1925, 6 months and 1 day after operation, showing face in repose, patient attempting to close eyes, trying to whistle, and attempting to show teeth.

one thing it feels different in some way. And another thing is when I first get up in the morning the corner of my mouth jumps. That is all I have noticed so far."

July 1, a letter says: "Sometimes I can move the left side of my mouth so that both sides look the same." August 25 she writes: "I can use the left side of my face to quite an extent now." On September 17, 1925, the patient came to Omaha and the photographs (Fig. 12) show the condition at that time. She still has a little difficulty with the tongue. Her speech is a little imperfect especially when she uses the labials. At this time she was quite discouraged, but on November 29, 1925, she writes: "I have noticed while treating it with battery that my upper lip pulls upward as if something was pulling it, and while practicing in front of a mirror I can do it voluntarily sometimes but not always. My left eyelids have been twitching a good deal lately."

Judging by the result in these two cases it seems fair to assume that this operation will not only restore facial symmetry and voluntary motion to the facial muscles but also bring about the return of a certain amount of emotional expression, the amount depending largely upon the mental development of the patient.

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For a more complete bibliography, refer to Gibson (3) above.

SINUS PERICRANII (STROMEYER)

Report of a Case; Review of the Literature[1]

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THE case which forms the basis of this report belongs to a group described as a clinical entity by Stromeyer in 1850. Since the original presentation, at least 38 separate articles have appeared in German and French literature. I have been able to find only two recorded cases in our literature and both were observed by one of our distinguished fellows, Dr. Harvey Cushing. His cases differ from the majority, in that they were associated with an intracranial tumor.

Such difference of opinion is found in the literature with regard to every phase of the subject from title to treatment, that it may not be amiss to report my case in detail with a summary of previous reviews of collected cases. It will not be my purpose to collect all of the recorded cases, as this has been done by Wislicenus, 1869; Lannelongue; 1886; and Mueller, 1912. Only such cases will be presented as seem to have a bearing on the development of the subject.

AUTHOR'S CASE

J. M., aged 34 years, was first seen in the Surgical Clinic of Touro Infirmary where the following notes were made. Patient complained of a lump on the back of his head, which he had noticed for the past 2 months. He had severe headaches and the pain in his head was always exaggerated when he stooped over or leaned back. In the upright position he had no pain.

Physical examination. Patient was fairly well developed and well nourished. The body surface was covered in an irregular symmetrical way with small hard subcutaneous fibromata (von Recklinghausen's disease). The skin otherwise presented no abnormality, reflexes were normal, and there were no glandular enlargements. Examination of the head and neck showed on the right side of the occiput, level with the external auditory canal and midway between the external auditory canal and the posterior midline, a small mass which is not adherent to the skin. The skin presents no redness, or other evidence of recent inflammatory disturbance. The mass disappears on pressure and, with this disappearance, the examining finger seems to drop into a small opening in the occipital bone. When pressure is released the soft mass reappears. The mass does not pulsate and it is not expansile in character. A radiographic examination of the skull shows an opening apparently in the region of the lateral sinus. The blood vessel markings within the skull are very distinct.

Patient was admitted to hospital for observation June 27, 1922. Pre-operative diagnosis: meningocele. Postoperative diagnosis: diverticulum of lateral sinus and anomalous opening in the skull communicating with the jugular vein.

Operation. A convex incision was made about 4 inches in length following the hair line; the upper limit corresponding to the right mastoid and extending to the midline posteriorly. The skin and pericranial tissues were dissected away from the tumor. The characteristics of the tumor could then be determined. The mass was about 2 inches in diameter, its walls were thin, and through them in the mass could be seen movements resembling an eddy. The caliber of the tumor was irregular, as a result of constrictions on the surface. There was no *expansile* pulsation and no thrill. Believing at that time that I was dealing with aneurismal varix of the lateral sinus, I asked Dr. Matas, chief of the department, to see the patient. He advised that we try to free the mass from the pericranial tissues and if possible to ligate it at its base. The walls of the mass were carefully dissected away from the underlying bone. The jugular vein was ligated at its point of communication with the sac of the tumor mass. There was some bleeding from the sac, but we were able to twist it on itself until a small pedicle was formed which we were able to ligate flush with the skull. An opening in the skull large enough to admit the tip of the little finger was the means of exit for the tumor mass. The pericranium was undermined and the opening closed over by an overlapping flap. The skin was sutured with silkworm gut and plain catgut.

Laboratory findings. Two pieces of tissue each 2 by 1 centimeter, red in color, irregular in outline, soft in consistency, were examined. Both pieces of tissue were blood vessels which had been split longitudinally. The walls of the tumor were connective tissue lined with endothelium (Lanford).

Postoperative course. On June 29, 1922, the first day after operation, the record shows no nausea or dizziness. He has a slight headache, but the pupils remain equal and there is no cyanosis. Pulse volume and rate are good. On July 4, the dressings were changed and the sutures removed. The wound had healed by primary union. Patient left the hospital on July 8, and reported to the clinic for observation during the following few weeks.

[1] Surgical Division, Touro Infirmary. Read before the Southern Surgical Association, Louisville, December 15-17, 1925.

Fig. 1. Photograph showing line of incision.

Follow-up notes. June 25, 1923: Patient reports that he has been feeling well since operation. He has not noted a recurrence of the swelling but there is "a funny feeling on the right side of the head when he raises anything heavy." Examination shows that the scar is covered by hair and no recurrence of swelling and no induration along the course of the jugular vein are found. An anomalous opening in the skull can be palpated.

February 19, 1925: Recently patient has complained of "top of his head" (by this patient refers to the occipital region) and some dizziness at times when working. Examination of the site of the previous operation shows the scar to be smooth and not elevated. The mass which he complains of is not adherent to the skin, and is slightly movable. Diagnosis: neurofibromata.

Operation, March 2, 1925. To the right of the posterior midline there are large vascular channels everywhere. Two neurofibromata were removed. This specimen was sent to the laboratory.

August 8, 1925. On the right side of the head, at a point about 20 centimeters from the nasion and just below the level of the supra-orbital ridge, a depression large enough to admit the tip of the index finger is found. The edge of the depression is irregular. The skin covering the scar of the original operative wound is freely movable over the skull. The patient is free of symptoms.

After a careful review of the literature it seems to me that this case belongs undoubtedly to the type of Stromeyer's sinus pericranii. The outstanding features of the case are:

Fig. 2. Roentgenogram of patient.

1. The vascular pericranial tumor communicated directly with the lateral sinus through an anomalous opening.
2. The anomalous opening was probably congenital in origin.
3. It was not associated with the history of trauma.
4. The association of this tumor with von Recklinghausen's disease is an unusual finding. Whether there is any relationship between the two is impossible to say, but it offers unusual opportunity for speculation.
5. With the exception of headache and discomfort when leaning back or stooping forward the patient suffered no inconvenience.
6. There was no bruit or expansile pulsations.
7. The walls of the tumor were lined with endothelium.

The significance of some of these characteristics will be better appreciated after reviewing some of the reported cases. The cases which prompted Stromeyer to suggest the term sinus pericranii were reported by him in the *Deutsche Klinic*, 1850.

The first of these concerned a boy of 6 years, who during his second year had fallen from a considerable height upon his head and sustained a depression of the sagittal suture. At its deepest point the depres-

sion measured approximately 2.5 millimeters. The entire area of depression of bone, about 2.5 square inches in extent, was covered by a sanguineous cyst which, when filled, projected for approximately 3 millimeters, but, when empty, permitted of free palpation of the bone and of recognition of the defective formation of its outer table. Turgescence of the cyst was increased by all factors which induced congestion, such as crying, coughing, inclination of the head, compression of the jugular veins, et cetera. With the child in the usual position no fluid was observed in the region of the depression.

In the second case the patient, a man of twenty, exhibited above the left eye a congenital tumor, treatment of which by physicians consulted by his parents immediately following his birth had proved ineffectual. The tumor, which according to his statement presented comparatively the same dimensions as in early childhood, extended from the glabella for a distance of 2 inches toward the left and from the arcus superciliaris for a space of 3 millimeters above the beginning of the growth of hair. It involved an area of approximately 4 square inches and when filled projected about 1 inch beyond the surface of the forehead. This occurred only on exertion, when the patient stooped, coughed, or sneezed, or following compression of the jugular veins, under the influence of heat, and as a result of all factors which impelled the blood towards the head or impeded its return. Near the outer extremity of the arcus superciliaris was felt, through the emptied tumor, a depression in the frontal bone which suggested loss of substance of the bone, and at the same point an area, where apparently a moderately large foramen existed. The patient experienced no discomfort except when he wore a heavy head covering or overexerted himself, whereupon vertigo and a sensation as of rupture of the distended tumor ensued. Color of the skin remained unaltered even when the tumor was filled. The latter was readily evacuated by pressure, and under the influence of the factors referred to above became filled within 30 seconds, in which condition it appeared sharply defined and entirely symmetrical.

In the opinion of Stromeyer, the above described phenomena indicated clearly that in these cases filling of the sac with venous blood occurred, and that a portion of the external table of the frontal bone was lacking. "An attempt to remove or otherwise to treat the tumor was regarded as useless and dangerous and was therefore not made."

It is obvious that Stromeyer recognized that the conditions described by him could result from congenital anomalies or follow trauma.

Confusion still exists in regard to the type of case which Stromeyer included in his original description. This may be observed from the following quotations:

Achilles Mueller: "Stromeyer drew his conception of the disease picture from a case of Hecker and from two cases with which he himself worked, in which as a result of a trauma a vein was torn at its point of departure from the emissarium. The blood from it flowed under the periosteum, and since the vessel could not retract itself within its rigid bony canal the bleeding was not arrested. The wall which surrounds the outpouring of blood will gradually become clothed with connective tissue; the cavity thus created remained permanently enclosed in the circulation and in permanent connection with the veins of the skull. . . . There are a large number of cases which certainly cannot be cleared up by the explanation given by Stromeyer, but which must be referred to congenital, or perhaps even acquired, vascular anomalies."

Borchard, in 1916, reiterated the conception of the pathology of sinus pericranii attributed by Mueller to Stromeyer.

As late as 1924, Sudhoff did not realize that Stromeyer included the congenital type of tumor in his original description as is evidenced by the following: "Many conditions are designated as sinus pericranii which do not have the exact picture described by Stromeyer. He means by it only a subperiosteal hæmatoma on the skull which occurs through the tearing of a vein by its protrusion through an opening. This condition then always requires trauma as a causal agency."

In 1851, Dufour, without knowledge of Stromeyer's contribution, reported the following case under the title of "New Variety of Blood Tumor."

After careful consideration of all of the then available classifications of tumors of the vault of the cranium he proposed the term "osteovascular fistula." None of the reports are more elaborate in detail; therefore a full abstract is appended. Particular attention is directed to the autopsy findings.

Dufour's case: In 1799 during an assault on a fortification he was struck on the right lateral portion of the forehead about 3 centimeters from the

median line. He was rendered unconscious at once and was carried off the battle field. He did not regain consciousness for 24 hours. The surgeon who treated him said that he had a fracture of the skull. The ultimate result of this wound was that he was incapacitated from following his profession of a soldier. When he leaned forward with his head toward the ground, there was formed a swelling the size of a nut at the site of the lesion. This swelling was violet in color and disappeared when he raised his head.

In 1847, the surgeon, M. Hutin, made a detailed examination of all the living veterans and he took a great interest in this case. He found no apparent scar but there was a very evident depression due probably to the result of absorption of a part of the diploe. The sac, which was formed of very thin skin, was not apparent when the patient was in the upright position, seated, or lying on his back, but when he leaned forward the sac became evident and was about the size of half an egg. It was livid in color due to the presence of blood and no doubt was formed in the same manner as cysts are usually formed in contused tissues. It could not be determined whether there was an opening into the superior longitudinal sinus.

On October 28, 1851, he was admitted to the infirmary for erysipelas of the neck and upper part of the thorax complicated with chronic bronchitis. In spite of energetic treatment the disease ran its course and patient died November 3.

The autopsy was performed November 5, 36 hours after death. The cranium showed nothing abnormal as to the size or protuberances. On the forehead, 2 centimeters below the hair line and to the right of the median line, there was a small cutaneous area about 2 centimeters in diameter, which was distinct from the rest of the skin by its slightly pinkish color, its fineness and its wrinkling. It corresponded to a depression of the bone which was very evident on palpation. When the head was placed in a very low position the tumor could not be made to appear.

The brain was normal, of firm consistency, and was without traces of old or recent areas of apoplexy. The white and gray matter were quite distinct from each other. The vascular network of the pia mater did not show any infiltration and was only moderately injected. The cerebral convolutions were easily detachable, even in the vicinity of the lesion. This was not true of the membranes themselves. At 3 centimeters from the falx cerebri on the right side the visceral layer of the arachnoid was lined by the pia mater and adherent to the parietal layer and with the dura mater. On stretching these pathologic tissues a few drops of blood ran into the arachnoidal cavity. Up to this point the dura mater was easily separated from the cranial vault. At 3 centimeters from the falx cerebri, separation could not be accomplished without rupturing the adhesions which were present. It was then found that there were many reddish points on the dura mater which appeared to be the orifices of gaping vessels. In the bone and opposite these vascular mouths, there were small solutions of continuity in the tables of the bone. Water poured into this small space was seen to pass promptly under the external skin and the thin portion of skin easily became distended. The injection of water or the insufflation of air through the superior longitudinal sinus as well as the introduction of bristles in the venous canals emanating from the same sinus and their penetration to the site of the lesion showed that there was a pathological communication between the sinus and the openings in the bone and hence into the external sac. It should also be mentioned that the caliber of the vessel appeared to be slightly enlarged and that it was filled with a long, reddish, fibrous clot.

The primary etiological factor in this case was trauma. The first symptoms were those of cerebral concussion complicated by direct fracture. Later there was the formation of a sac containing blood. This sac formed a soft non-pulsatile tumor which appeared when the head was inclined forward and disappeared when the head was returned to the upright position. The skin was never affected as to its continuity but it gradually underwent a modification which reduced it to the thinness of a sheet of paper. The skin was sufficiently transparent to allow the first surgeon to diagnose the presence of blood in the tumor. Immediately after the blow there was a depression in the bone at the site of the contusion. This depression was the primary lesion, the first link in the pathological chain of events. It is probable that the external table alone was fractured, the inner table remaining intact but being subjected to the pressure of bone splinters.

The next question is whether the sac was formed at first or was only secondary. The autopsy findings speak in favor of a secondary development of the blood tumor.

The successive phenomena could have occurred as follows: depression of the surface of the frontal bone; obscure osteitis and interstitial absorption at the expense of the tables and diploe of the bone; propagation of the inflammatory and adhesive nidus to the corresponding portions of the meninges; extension of the ulcerated processes to the meninges, increasing the caliber of the vessels or leading to the formation of new vessels; finally there were established communications between the arachnoidal vessels and the canals emanating from the superior longitudinal sinus with the openings in the rarefied bone and with a circumscribed portion of the external skin, the latter becoming distended by the effusion of blood in virtue of physical laws.

In the discussion of his findings Dufour says: "The reducibility of the sac must be considered in the classification of this lesion, which must be considered as a blood hernia

of the vault of the cranium by communication of the meningeal vessels with the external skin by means of an opening in the bone."

In 1869 Wislicenus, in his inaugural dissertation, Zurich, presented two cases which came under his observation, and he collected from the literature 26 cases. The cases of Wislicenus are as follows:

CASE 1. A boy of 11 years with negative family and personal history presented a congenital tumor upon the forehead, which at first completely covered the left eye, but shortly after birth diminished in size, and left the eye free. Fourteen days later, however, the tumor assumed the size which it exhibited at the time patient was admitted to hospital. During attacks of laryngitis from which the patient suffered frequently the tumor swelled, became tense, and the skin over it appeared bluish. There were no pains, headache, or vertigo. The tumor caused no disturbances even when filled with blood and it disappeared readily on pressure. It involved the entire height of the forehead and extended from the upper margin of the orbit to the hair line, beyond which it penetrated for a short distance so that its upper portion was covered with hair. The tumor extended horizontally from the median line of the forehead to the anterior border of the temporal fossa, its horizontal diameter measuring 6.5 centimeters, its vertical diameter 5 centimeters, its height 2.5 centimeters, and its circumference at the base, 19 centimeters. A shallow furrow divided it into two parts.

When the patient wrinkled the forehead, the tumor appeared to be located below the frontal muscle and appeared to pulsate synchronously with the radial pulse. Palpation revealed fluctuation and a tumor of soft consistency. On more careful palpation it was found that at several points the tumor was composed of small, irregular bodies with smooth surfaces. Its base was irregularly humped, and between the humps there were irregular depressions in the form of fissures. The tumor increased in size with all activities which caused rushing of blood to the head, as stooping, coughing, pressure and compression of the jugular veins. Compression of the carotids exerted no influence upon the extent or degree of filling or pulsation of the tumor. Circular compression had no influence upon the size of the tumor; therefore involvement of the branch of the temporal vein did not exist. This was evidenced also by the fact that pressure upon the tumor did not cause distention of the branch. A direct communication between the tumor and the dural sinus was here assumed, and from observations it was inferred that the communication was effected by means of a lumen of considerable size, since the contents of the tumor were evacuated in so short a time. It was believed highly probable that the tumor communicated with the superior longitudinal sinus.

CASE 2. A female factory worker, aged 15, when a child 35 weeks old had fallen downstairs. She was picked up unconscious and for several days had remained in a stuporous condition. Examination revealed upon the occiput over the region of the scar a markedly prominent tumor and a fissure in the bone which corresponded in length and direction with the injury inflicted by the fall. The case was diagnosed at that time as fracture of the cranial bones, and the death of the child was predicted. The skin above the tumor was incised and a quantity of dark blood was evacuated. The child was treated in the hospital and subsequently recovered but later on had a violent convulsion which continued for 5 hours. The mother stated that the edges of the fracture then became more and more separated.

When seen by the author, the patient complained only of frequent headaches, particularly after stooping, but had never suffered from vertigo or from pains in the region of the tumor. General examination of the patient was negative. A moderately extensive area of pulsation almost entirely covered by hair was noted upon the posterior portion of the left parietal bone and the left half of the occipital bone. This area was 10.5 by 3.5 centimeters. Pulsation was most marked in the lower posterior portion and was somewhat less evident in the upper anterior portion. The overlying skin was of normal color and was thickly covered with hair. Palpation revealed a deficiency of bone over the entire area of pulsation. Here the outer table of bone appeared to be absent. The entire area of depression was divided into six fields by five transverse ridges of bone. No abnormally distended vessels, either veins or arteries, were found in the region of the tumor. Pulsation was visible as well as palpable. There was marked fluctuation. The contents of the tumor were readily evacuated by pressure. No vertigo, headache, or convulsions. There was no discomfort due to the tumor. Filling was least evident with the head in the erect position. Bowing, stooping, coughing, and pressure caused filling of the tumor which upon cessation of such activities resumed its natural size. Compression of the left carotid caused the tumor to diminish in size and pulsation to become weaker, while compression of the right carotid exerted no influence either upon size or pulsation. Compression of the right jugular produced marked swelling of the tumor and compression of the left jugular vein produced only slight swelling. This varying influence of both jugular veins led to the assumption of the existence of an abnormality of the sinus of the dura mater.

This author carefully considered all the points of difference expressed in the literature with regard to the condition. He expressed preference for the name sinus pericranii because "it can only mean the pathological form as there is no sinus on the outside of a normal cranium."

The structure of the walls of these tumors, anatomic location, contents, symptoms, differential diagnosis as presented by Wislicenus is so well done that it will be well to quote rather extensively. "The structure of the tumor walls depend on their origin. Either they have walls of their own from the beginning (as in dilatation of an emissary vein) or they have at first no walls of their own (traumatic), the blood escaping into the soft parts of the skull, a capsule being formed later."

The contents of this tumor is always venous blood. The bone "below the tumor is frequently affected. It may be either depressed by a trauma or through resorption of the bony substance from continued pressure of the tumor. A communicating opening in the bone could only very rarely be demonstrated."

This last statement can readily be understood because no cases had been operated upon up to this time and only a few had come to autopsy.

The next statement of this author is of particular value since it is prophetic with regard to the curative method of treatment. He says in his discussion: "A communicating opening is only of real value if closing it prevents a reappearance of the tumor after a reduction of the latter. In most cases a communicating opening represents the only connection of the tumor cavity with the venous circulation." In spite of this statement more than 30 years elapsed before the first successful operation was done for the cure of this disease by Franke.

The forehead is given as the most frequent site, next the sagittal suture, then the occiput.

"The tumors are usually invisible in the erect position. In some cases they appear only on bending forward or any other movement retarding the return of the venous blood. The size varies greatly. The skin covering the tumor is sometimes so thin that the contents of the latter give it a bluish tint. The consistency of the tumor is always soft, and at times a fluctuating area is elicited. Pressure causes the tumor to disappear. Compression of the jugular vein has a distinct influence on the fullness of the tumor; its volume increases considerably. The patient usually suffers very little. The growth of the tumor is usually slow. . . .

"Differential diagnosis is declared to involve especially the distinction of pericranial sinus from meningocele and encephalocele. Absence of hydrocephalic symptoms, bluish coloration of overlying skin, detection of a murmur, absence of indications of cerebral pressure on compression of the tumor and of a pedicle, more rapid and extensive increase in volume of pericranial sinus through inclination of the head or compression of the jugular veins, verification of firmer content, and slow growth are all said to exclude existence of meningocele and to indicate the presence of pericranial sinus in a patient, while in the differential diagnosis between pericranial sinus and encephalocele the following facts should be taken into account, namely, that the latter is as slightly transparent as the former, that encephalocele may exhibit a higher degree of resistance than pericranial sinus and usually fails to disappear completely on pressure, that the aperture of communication with the internal portion of the cranium is larger in encephalocele than in pericranial sinus, that encephalocele is almost invariably congenital, and children thus afflicted rarely live long."

In spite of his wonderful study of the subject, we find Wislicenus making this statement: "A conscientious medical man will therefore never think of operating after the diagnosis of sinus pericranii has been made. It only remains to try to influence the tumor to disappear gradually by long continuous pressure (so far never successful) or to prevent its growth by a suitable apparatus and finally to protect it against traumatism."

Lannelongue, in 1886, reported one case and discussed all available cases in the literature. The personal case of Lannelongue was a child who had a soft irreducible tumor on the cranium which was diagnosed angioma. At autopsy it was found that this tumor had a pedicle which extended through the membrane between the two parietal bones and communicated with the longitudinal sinus by means of large veins.

He found twelve congenital cases in the literature. The remainder were traumatic in origin.

He was of the opinion that direct compression was the best method of treatment. He further expressed the belief that if the growth is continuous and rapid, extirpation should be the method of choice.

The first successful operative case was reported by Franke, 1902. An abstract of it follows:

A serving maid, 20 years old, with negative personal and family history, in early childhood had behind the right ear a slight depression in the bone. Later she observed that in the prone position a soft tumor which was readily displaceable appeared upon the right posterior half of the cranium and at first had caused no disturbance but had a few years previously provoked headache and had gradually increased in size so that the patient was unable to stoop without provoking extremely severe pains which had finally become so intense as to render her unfit for work. Application of iodine was prescribed without result.

Examination revealed a well nourished female of healthy appearance who presented upon the upper posterior portion of the cranium a soft superficial, slightly fluctuating, depressible tumor covered with normal skin. It was painless on pressure. A shallow depression in the cranium was palpable. Following removal of the hair the tumor appeared more prominent with the patient in the half sitting position and with slight stooping it exhibited an uneven surface.

On bowing the head the tumor increased markedly in size and the skin, which had previously appeared normal, assumed a slightly bluish tint. Slight pulsation of the tumor was then marked but when the patient returned to the erect position it disappeared almost entirely and no longer pulsated.

A slight globular pulsating prominence was observed behind the right ear about 1 centimeter from the insertion of the auricular muscle and somewhat above a horizontal line drawn through the upper wall of the external auditory meatus. A tentative diagnosis of diffused reticulated angioma or blood cyst was made.

At operation a longitudinal incision was made over the tumor and a dark brownish red membrane was exposed and freely dissected away from the anterior and inferior margin of the tumor. An attempt to detach this membrane from the roof of the cranium caused laceration of the former and permitted the release of a large stream of venous blood which was checked by compression with tampons of iodoform gauze. Efforts to detach the cystic wall at other points led to repeated hæmorrhages. The author was about to discontinue the operation on account of impending shock, and salt solution was administered; however, the operation was continued and on careful removal of the tampon a circular aperture which permitted the insertion of the tip of the finger was encountered at the anterior end of the tip of the depression in the cranial roof. No free communication with a sinus was remarked at these points and no angiomatous or cavernous degeneration was noted either in skin or bone surrounding the cyst. The incision was closed by means of sutures. The openings in the cranium were closed with tampons of iodoform gauze and a tight compression bandage was applied.

It will be noted that a pre-operative diagnosis of sinus pericranii was not made. The operation consisted of incision, evacuation of the contents, and tamponade.

Six years later (1908) Arnheim presented:

A male patient, aged 20 years, with tumor of the soft parts over the right frontal bone, which was attributed by the latter to a fall upon the forehead sustained some 6 years previously. On account of other injuries suffered in the same fall the patient was obliged to remain 3 weeks in bed, on arising from which he noted for the first time the existence of the tumor, which was declared to have retained meanwhile its original character. The tumor itself varied in size according to the position of the head. It was barely visible when the head was held erect and appeared as if withdrawn into the cranium, leaving in its place a depression which admitted the tip of the finger, but when the head was inclined in a forward direction, or the patient coughed or breathed deeply, the tumor attained the approximate size of a walnut, and the skin which covered it assumed a bluish-red color, and revealed marked pulsation. When the patient stood up and pressure was exerted upon the tumor with the tip of the finger, it diminished rapidly in size, and when all blood had left it, an umbilicate depression was felt in the frontal bone.

The chief value to be attributed to this report is the theory of formation of sinus pericranii. While it is true that this is a repetition of Stromeyer's opinion of the formation of traumatic cases, quotation of this in full should be of service.

In the case reported in this article it was assumed that a vein had been torn from its bony support in the periosteum by the fall, and that a copious effusion of blood had occurred in consequence and had remained in constant communication with the anterior of the cranium through the vein, which was no longer capable of retraction and occlusion in the rigidly walled bony canal. The effusion was in part resorbed, but complete reunion of the separated soft parts was impossible since fresh blood continually flowed from the open vein. The wall of

the cavity gradually became lined with connective tissue and finally the cyst appeared and formed an appendix to the vascular system.

It will be noted that the walls of the traumatic type have a connective tissue lining and the congenital tumors have an endothelial lining.

Arnheim expressed the very conservative attitude with regard to treatment. Witness:

"In Arnheim's opinion, on account of the intimate connection with the sinuses of the cranium, treatment should at first be restricted to methodical compression and a plastic operation should be resorted to only in case of necessity."

Compare the above with P. Hirsch's expression: "only surgery may be considered, the operation to consist of ligature of the veins or suture and the osteoplastic closing of the bone fissure." His case report follows.

The patient is a man 47 years old, who for 25 years had noticed that when he stooped, a small tumor was noticeable on the left side of his forehead. This had given him no trouble at all until during the last year, when the tumor had become larger and lately the patient had complained of headache and dizziness. On the left side of the forehead, there was a small depression which felt as if the bones of the forehead itself were excavated. In the vicinity was a proliferation of the bone, a mound which was sharply limited laterally which ran off toward the middle. With the finger in this cavity, one could feel a small fissure through which, occasionally, pulsation could be felt. The patient was then asked to stoop. The tumor was about the size of a plum, and fluctuating. No pulsation could be demonstrated. There was normal skin over the tumor, and a few superficial veins traversed the skin. When the patient stood up again, the tumor apparently went back, apparently in the upper portions first, while in the lower part, the protuberance could still be made out. There seemed to be a fluid in this sac.

During the following year, Krause and Mueller contributed to the subject. The most important surgical contribution is that of Krause who described a carefully planned operative procedure for the cure of sinus pericranii. The essential features of this operation are:

1. Circular incision.
2. Separation of the periosteum from the skull at a distance from the line of the incision.
3. Removal of part of the bony ring around the pedicle.
4. Incision of the tumor.
5. Closure of the opening by a flap which consists of skin, periosteum, and bone.

Case report follows.

In this case the patient when in the erect position exhibited in the middle of the forehead a depression which was on more careful palpation revealed as a fissure in the bone of 27 millimeters in length and a few millimeters in breadth. On bending a swelling appeared, gradually became pulsating, then markedly inflated without pulsation, and passed over tightly filled veins. The same phenomenon was produced by compression of both jugular veins, and also when the patient strained or coughed. The tumor was diagnosed as pericranial sinus (Stromeyer). Since with the patient in the dorsal position the tumor disappeared, the jugular vein was compressed and the tumor marked out with the knife. Following loosening of the cutaneous flap, a circular incision was made around the entire sinus together with the periosteum, the latter was incised as far as the bone, and the wall of the sinus was pushed aside with the raspatory. A pedicle which extended in an inward direction was encountered near the fissure. The bone in the region of the pedicle was removed, and the cranial cavity opened, whereupon it was perceived that the pedicle was closely united to the longitudinal sinus. A flap of skin, periosteum, and bone was formed and laid over the defect, while the first cutaneous flap was sutured in its place.

Weiting's case, an abstract of which follows, resulted from trauma. The recital of this case should be of interest because of the unusual operative procedure which consisted of cauterization of the perforations with a view of establishing adhesions.

In a coachman, aged 20 years, who had sustained a depressed fracture of the right parietal bone, the author noted on forward inclination of the head the appearance at the site of the depression of soft, fluctuating protrusions which were readily reducible through pressure. Subjective manifestations consisted of a sensation of vertigo and headache. Focal symptoms were absent. A tentative diagnosis of venous blood spaces communicating with the inner regions of the cranium (probably as the result of laceration of the longitudinal sinus) was confirmed by operation. In the shallow region of the depression the skull cap was reduced to the thinness of paper and at five or six points revealed cribriform perforations, through which communication existed between venous epidural and extradural blood spaces and those situated in part below and in part within the periosteum. Pressure in these blood

spaces was at times positive and at times negative, according to the position of the head. In order to establish a firm cicatricial adhesion of the scalp to the region of depression, the periosteum was pushed back, the perforations were cauterized, and the galea was firmly sutured over all. This procedure sufficed with slightest pressure in the sinus to prevent the passage of blood, while complete disappearance of subjective disturbances also followed in due course.

After an exhaustive study of the literature, particularly with reference to the attempts at classification of various cases into separate groups, Mueller concludes: "Clinically the anamnesis offers the chief distinguishing mark in determining whether a tumor is congenital or traumatic. The disease rests with certainty upon a vascular anomaly." He believes that there is very little justification for dividing the cases into separate groups.

The operative treatment according to Mueller "must consist in the removal of the sac and the closing of the opening through which it communicates with the interior of the skull."

Mueller's case:

A girl, aged 13 years, sought the aid of the clinic on account of a small swelling which lay in the region of the left parietal eminence, and which had lately been the cause of severe pains in the head. When the patient kept the head in an upright position, the swelling was small and scarcely noticeable, but when the head was bent either forward or backward, the swelling increased to about the size of a walnut. Upon returning the head to an upright position, the swelling again disappeared. The tumor was soft and fluctuating. When the patient stood the tumor could be made even smaller than usual by pressing upon it, its contents doubtless going into the interior of the skull. In sneezing and coughing, there was an increase in the size of the formation, but this could not be brought about by a compression of the venæ jugulares. There was no pulsation. When the tumor emptied, a depression in the underlying bone with a distinct margin could be felt plainly, especially in the anterior part. The bony skull under the tumor felt the same as in an impression fracture, except that a real defect was present. The roentgen examination showed unmistakably the depression which could be felt. The Wassermann test was negative. A test puncture showed circulating blood as the contents of the cyst. The patient had had this defect ever since her earliest childhood. The pains in the forehead, of which the patient complained, were the cause of the operation which was performed under narcosis, by Hildebrand on October 20, 1911. The skin above the tumor was cut off in the form of a flap. Immediately under the scalp there was a sac composed of many bays, and a circular incision was made around its base to the bone. In this incision different vessels which led to various places in the vicinity were severed and subjected to ligatures. The whole tumor was then removed from its pedicle, together with the periosteum. The flat depression in the bone which has been mentioned was thus brought into view, and except that it seemed somewhat thinner than normal, the bone appeared otherwise quite normal. Fresh blood flowed in a constant stream, but without pulsation, from two small emissaries: the one larger and as thick as a pin, and the other extremely thin. Since the bleeding did not stop upon the application of tampons, the point of an ivory needle was introduced into each of the very fine openings, and the shaft then taken off close to the bone. They were then tamponed with iodoform gauze, a suture of the skin made, and compression bandages applied. Convalescence was smooth.

Pathologist's report. The small tumor consisted of fine network with numerous septa. Microscopically it was composed of a great number of narrow canals filled with blood, in parts of which an endothelium lining is visible. The formation measured by its histological structure, would be designated as a sort of cavernous angioma, but of an exceedingly venous character, since it is enclosed in the venous circulation. It receives its inflow from two emissaries in the sinus in the interior of the skull; its outflow follows the veins of the scalp.

Borchard, in 1916, restated the misconception that Stromeyer included only traumatic cases under the title of sinus pericranii as evidenced by "the source of the disease is a fracture of the skull caused by a blow from some blunt instrument. The congenital cephalohæmatoceles, which are also regarded as venous angioma by Lannelongue, do not belong here."

He reports in detail the following case.

K. M., 27 years old, had fallen upon the rear part of the head 13 years previously in running upon the ice. Patient had been unconscious for ¼ hour but had then returned home alone and had remained several days in bed. After 14 days a tumor had formed fairly suddenly on the right side of the occiput, and had continued to increase in size. The size of the tumor increased or decreased with each change of position, but after the first year it grew no larger. In case of strong exertion or of bending over, the patient felt severe pains on the right side of the neck, and across the right side of the head to the right eye.

On the right occiput, at a distance of 3 centimeters from the median line, corresponding exactly to the

anatomical position of the right sinus transversus, there was a longitudinally placed, plainly visible tumor 3 centimeters long by 1.5 centimeters high, flat and spread out widely over its whole length, and covered by skin which was neither thinned nor colored. The tumor felt softly elastic. There was no pulsation. Upon the application of a moderate degree of compression the tumor disappeared slowly but completely into the skull. One could then feel a bony, uneven, low wall about a depression as large as a finger tip. When the pressure was removed the tumor reappeared slowly, but did not attain its original size for several minutes. When he coughed or pressed it it became filled more rapidly. Compression of both jugular veins produced filling of the tumor. If only the right vein was compressed it resulted in no substantial change in the condition. The patient refused to undergo the severe shock of an operation.

This surgeon recognized the value of the operation suggested by Krause.

The outstanding importance of the X-ray as a diagnostic means is pointed out by Borchard: "The roentgen pictures alone clear up the whole relationship, and provide a viewpoint upon which to base the subsequent choice of the method of operation eventually to be used."

In 1917 Moerig added two cases to the literature.

The first of these was that of a male patient, aged 20 years. Four years before, he had fallen from a height and had struck the right side of his forehead. As evidence of this there was a swelling. The patient noticed that this swelling stood out whenever he bent his head forward. Recently he had complained of constant headache and dizzy feeling.

On the right side of the forehead could be noticed a slight irregular mass over the bone about the size of a pea. When the head was bent over, this place increased to about the size of a walnut. When the head was raised again, the tumor entirely disappeared. The X-ray showed no bone changes. At operation, there was found a bluish cyst, similar to a varix, coming out from the bone. The wall of this cyst was as thin as paper and when torn, it discharged an amount of fresh venous blood. It could be seen that the bleeding came from three fine openings of needle points in the bone.

The second case is that of a man aged 24 years who could not remember having been seriously ill. On the left side of the head, he had always noticed a depression. In this depression, there had always been a small protuberance. It could not be ascertained whether his birth had been difficult. He had never had any disturbances attributable to this place in his head. In the summer of 1915, he fell from a munition wagon and struck the left side of his head. He had not been unconscious and no trouble seemed to have followed this fall. In the beginning of August, 1916, he fell from a provision wagon and was for a short time stupefied, but not unconscious. He seemed to have no trouble after this fall.

At the end of August, the patient noticed that the head became swollen on the left side when he stooped or if he did hard work. At the same time, disturbances appeared. He had the feeling as if he were drunk. This feeling appeared if he suddenly stopped when walking fast. At the same time he had severe headaches. Also vomiting appeared and glimmering before the eyes. These troubles decreased somewhat after 14 days in the hospital. The tumor, which at first appeared quickly, now came more slowly.

The patient is a strong and healthy man; on the left side of the head, parallel with the sagittal suture, 3.5 centimeters distant from this, beginning close behind the left frontal protuberance, ran a smooth depression 9 centimeters posteriorly. Forward in the depression there was a protuberance about the size of a five pfennig piece, only a few millimeters high. This, and a small place in the posterior corner of the depression, were painful on pressure. The depression was about 2.5 millimeters wide and diminishes toward both ends. When the patient bends the head forward, there comes out over the depression a soft fluctuating tumor about 13 centimeters in length, and 3.5 centimeters in width; toward the back this becomes very narrow. When the head is raised again, the tumor disappears. It may also be felt when both venæ jugulares are compressed. It takes 45 seconds to fill again; emptying takes about 2 minutes. Roentgen-ray examination shows nothing abnormal in the bones. It seems remarkable that through pressure of the fingers at different points of the boundaries of the tumor, one could not prevent a filling of the blood sac. No opening in the bone could be felt. This leads one to suppose that there are many openings in the bony skull. Communication with the sinus was shown to exist by test puncture, which gave venous blood. Treatment can be only surgical.

Sudhoff, in 1924, under the title of "A Simple New Operative Method for Sinus Pericranii" reviewed the literature extensively. Sudhoff cites Demme's and Heineke's classification, giving preference to the latter as being clearer. The classification of pericranial vascular tumors according to Heineke is: (1) Varix simplex communicans—a congenital condition caused by anomalies of the vessels; (2) varix racemosus communicans —a bundle of widened veins, likewise congenital; (3) varix spurius communicans—which follows trauma and is the sinus peri-

cranii of Stromeyer; (4) varix herniosus sinus sagittalis—is a bulging of the sinus sagittalis through an opening in the skull.

All writers agree with Sudhoff when he states: "The clinical picture is always the same." It will simplify matters greatly if further attempts to differentiate be avoided, except as to the etiology.

Sudhoff describes the operative procedures which have been used, and expresses preference for Payr's operation: "He dissects the sinus after he has cut around it to the bone, raises it as far as the pedicle, ligates the pedicle, and closes the opening in the skull with a paraffin or wax plug. This is either inserted immediately, or else after he has bored a tiny hole in order to locate the origin of the communicating vein. Three cases were so operated upon in the author's clinic. The result was very good."

SUMMARY

1. Sinus pericranii as described by Stromeyer in 1850 included both congenital and acquired lesions.

2. The clinical picture is always the same in both types: A soft fluctuating, slowly growing vascular tumor of the scalp which communicates directly with an intracranial sinus through an anomalous opening of congenital or acquired origin. These tumors as a rule are not evident when the patient is erect, but they become prominent when the patient coughs, sneezes, compresses the jugular vein, or does anything which increases intracranial pressure and which interferes with venous return from the skull.

3. The tumor is reducible into the skull.

4. A bony defect is evident on palpation.

5. The X-ray is invaluable as a diagnostic means. The anomalous communication is demonstrated beyond question.

6. Endothelial lining of the walls of a tumor differentiates the congenital from the acquired type. The latter has a connective tissue lining.

7. Surgery is the only rational means of cure.

8. The procedure followed in this case was suggested by Professor Rudolph Matas.

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[1] I wish to thank the Prior Company and the Research Department of the American College of Surgeons for the valuable reprints and translations prepared for me.

INTERCOSTAL NEURALGIA AS A CAUSE OF ABDOMINAL PAIN AND TENDERNESS

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NEURALGIA of the nerves which supply the abdominal walls is a subject which has never received merited recognition in medical literature. It is an exceedingly common affection, and failure to recognize its presence inevitably leads to erroneous diagnoses and often results in futile operations.

The nerves which supply the abdominal walls are the lower six intercostal nerves and the iliohypogastric and ilio-inguinal branches of the first lumbar nerve.

Physicians generally are alert to consider and detect intercostal neuralgia in the upper chest wall, and yet they commonly fail to consider its possibility or detect its presence in the abdominal wall. Medical practitioners are prone to ignore the fact that intercostal neuralgia causes pain and tenderness over the abdomen which may simulate any one of various intra-abdominal, gynecological, or genito-urinary lesions. I see an average of one or two patients a week, and sometimes as many as three new patients in one day, in whom fairly competent physicians have failed to recognize the superficial neuralgia, and have referred the patients for operation for various non-existent intra-abdominal lesions.

In order to differentiate between parietal tenderness and intra-abdominal tenderness, I have devised a simple two-stage bedside test which I have not seen mentioned anywhere. (A) In any patient complaining of abdominal pain and tenderness, the examiner follows the classical advice of gaining the confidence of both the patient and his muscles and then palpates in the usual manner. Irrespective of whether the tenderness is parietal or intra-abdominal, the examiner's fingers, as a rule, will dip fairly deeply into the abdomen before tenderness is elicited. This deep position of the fingers has generally been regarded as proof that the tenderness is intra-abdominal, but in a surprisingly high percentage of cases this assumption will prove to be an error as shown by the next step. (B) The examiner keeps his fingers at the most sensitive area he has discovered on deep pressure and requests the patient to make his abdominal muscles rigid by contracting his diaphragm or by raising and holding his head from the pillow; as the patient tenses his muscles, the examiner relaxes his finger pressure so that his fingers rise out of the abdomen; and then with the patient's abdominal muscles tense the examiner reapplies pressure with his finger tips and he also may exert a little twisting motion with them. If the case under examination is one of intra-abdominal tenderness only, the B stage of test will fail to elicit any tenderness when strenuous pressure is applied over tense muscles. If the case is one of parietal tenderness, almost or quite as much tenderness will be elicited by the B test as by the A test.

My clinical experience with this two-stage test indicates that parietal neuralgia causes tenderness in all three sensory layers of the abdominal wall: i.e., in (1) skin, (2) muscles, and (3) peritoneum. Palpation by the A test with relaxed musculature elicits the combined tenderness of all three layers, whereas palpation by the B test elicits tenderness only in the skin and muscles, because thoroughly tense muscles protect the underlying sensitive peritoneum from painful pressure. With tense abdominal muscles, it therefore happens that even when all the tenderness is in the parietes, the patient often notes distinctly less tenderness in the B test than in the A test.

With the A and B tests as part of the routine in abdominal examination I have been amazed at the frequency with which the tenderness is located in the parietes. Excluding cases of peritonitis, I have found tenderness in the parietes more often than in the abdomen itself. In the absence of a complicating peritonitis the great majority of intra-abdominal lesions are free from demonstrable tenderness. C. H. Mayo[1] has recently commented on the

[1] J. Am. M. Ass., 1924, lxxxiii, 592.

amazing hyposensitiveness of areas in the stomach, gall bladder, and appendix, despite the presence of extensive disease as disclosed by operation.

Intra-abdominal tenderness signifies some form of intra-abdominal lesion, the diagnosis of which does not come within the domain of this paper. Parietal tenderness exceptionally may be due to a variety of local lesions, as dermatitis, cellulitis, myositis, trauma, abscess, etc., of the abdominal wall, but they will also be dismissed without further discussion.

Usually parietal abdominal tenderness is caused by neuralgia of the lower six intercostal and first lumbar nerves. Involvement of a single nerve is rare. Bilateral involvement is fairly common. Usually several adjacent nerves on one side only are affected. Not infrequently all twelve intercostals and the first lumbar as well as additional lumbar nerves and some of the cervical nerves may be involved either unilaterally or bilaterally. It is a curious and very striking fact, however, that almost without exception the only spontaneous pain of which the patients complain is felt in some part of the soft abdomen irrespective of the number of nerves involved. Patients almost never volunteer a statement that they have any pain over the rib area and when asked leading questions they nearly always deny rib area pain, with the exception that spontaneous pain may be present in the breasts of women. They are nearly all convinced their abdominal pains are deep-seated, that is, inside the abdomen and not in the parietes.

The area of spontaneous abdominal pain is usually smaller than the area of abdominal tenderness.

In making tests for tenderness, comparison should be made between an area of normal sensation and the particular area under examination. Usually the comparison is best made by testing corresponding areas on opposite sides of the midline. When the lesion is bilateral, an area of normal sensation should be selected over an arm, leg, neck, or upper chest. Some of the tests for tenderness require intelligent co-operation on the part of the patient, and are therefore of decidedly less value in mentally incompetent patients. Tenderness due to intercostal neuralgia can be demonstrated in a number of ways.

1. *By deep pressure.* Tenderness over the terminal branches of the parietal nerves may be demonstrated by the firm pressure of palpating fingers both when the abdominal muscles are relaxed, as in test A, and when they are tense, as in test B. Usually the tenderness is not uniform throughout the hypersensitive area. The most marked tenderness is commonly found along the outer border of the rectus muscle in localized points which probably coincide with the points at which the nerve branches pierce the posterior layer of the rectus sheath.

2. *By pinch test.* Pinching of the skin and subcutaneous fat between the examiner's thumb and finger is the simplest, easiest, and most practical test for ascertaining the approximate area of tenderness. An interesting application of this test may be made in unilateral cases in which the hyperæsthesia approaches the midline by picking up a fold of fat and skin on each side of the midline and pinching it between thumb and finger, whereupon the patient will complain of pain on the affected side only. Another modification of this test consists of pressing skin and fat (without disturbance of peritoneum or muscles) against the inner side of the anterior-superior spine of the ilium. The area of tenderness as demonstrated by the pinch test is usually smaller than the area of deep pressure tenderness but is usually larger than the area of epicritic hyperæsthesia as shown by the next test.

3. *By superficial skin tests.* As a rule skin hyperæsthesia is revealed by pricking with a pin, by stroking with a cotton wisp, and by applying heat and cold. In exceptional cases all these tests may reveal an area of hypæsthesia instead of the usual area of hyperæsthesia. It is an interesting fact that in these cases of superficial hypæsthesia the (1) deep pressure and the (2) pinch tests both reveal hyperæsthesia.

4. *By pressure on nerve trunks.* Tenderness will be found along the course of the nerve trunks supplying the tender area. This tenderness is easily demonstrable in the case of the seventh, eighth, ninth, and tenth intercostal nerves and less so in the eleventh and twelfth

intercostals and first lumbar. Very often tenderness is present over many more nerve trunks than would be indicated by the area of peripheral tenderness as shown by tests 1, 2, and 3. For instance, the area of peripheral tenderness could be explained satisfactorily by involvement of the tenth and eleventh nerves only, yet frequently unilateral or occasionally bilateral tenderness of nerve trunks may be found up to, and including, the first intercostal. This association of nerve trunk tenderness seems to have been entirely overlooked by the various writers on the visceroparietal reflex. It is a curious fact that intercostal nerves that exhibit tenderness of their nerve trunks and their abdominal terminal branches usually do not exhibit tenderness of their terminal branches which supply the chest wall itself. Exceptionally these chest terminals may be involved and then tenderness by tests 1, 2, and 3 may be found extending from midline in front to midline of the back over the chest as well as over the abdomen.

5. By pinching flank muscles. In certain thin individuals it is possible to demonstrate tenderness by picking up a fold of skin, fat and superficial layer of muscle in the flank (iliocostal space at outer limit of abdomen) without encroaching on the underlying peritoneum even when tests 2 and 3 of the same area of skin and of skin and fat reveal normal sensation. In some instances this tenderness is diffuse in the muscles, and it is then apparently due to hypersensitive nerve terminals. In other instances, the tenderness is circumscribed and is apparently due to sensitiveness of the trunks of the twelfth intercostal and the abdominal branches of the first lumbar.

6. By pressure over transverse processes of vertebræ. Frequently when hyperæsthesia is absent in the skin and muscles overlying the vertebræ, and tenderness of the spinous processes is also absent, deep pressure will reveal tenderness of one or more transverse processes of the vertebræ. Usually the number of sensitive transverse processes is smaller than the number of tender nerve trunks. Occasionally a smaller number of less sensitive transverse processes is found on the opposite unaffected side. The cause of this tenderness is uncertain, but I am inclined at present to regard it as evidence of irritative lesions at the intervertebral foramina.

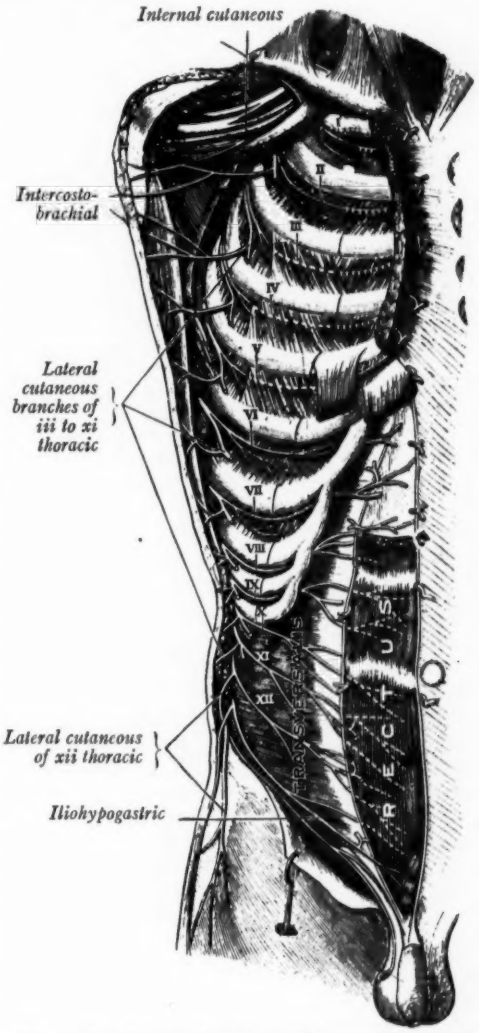

Fig. 1. Drawing showing intercostal nerves, the superficial muscles having been removed. (From Lewis' 20th ed., *Gray's Anatomy.*)

7. By pressure over remote areas. When the first and second intercostal nerves are affected, their large branches which run to the arm give rise to spontaneous pain or to tenderness or to both in the arm areas supplied by them. Involvement of these two and of other adjacent

intercostal nerves gives rise to pseudo-angina pectoris and probably also to some of the cases regarded as true angina. The entire arm may be painful and tender when the neuralgia affects adjacent cervical nerves. When the ilio-inguinal nerve is involved, a band of tenderness on pressure or pinching up to 2 inches in width may be found below and parallel to Poupart's ligament, and pinching of the two labia majora simultaneously between thumb and finger may reveal hypersensitiveness of the labium on the affected side only. When the last intercostal and first lumbar nerves are affected, there is very commonly found an area very sensitive to pressure over the upper part of the buttock just beneath the crest of the ilium, well posterior to the great trochanter. Demonstration to medical consultants of this area of buttock tenderness has proved a very valuable aid in convincing them that the patient under examination has parietal rather than intra-abdominal tenderness. I believe this buttock area of hypersensibility is due to involvement of the iliac branches of the ilio-inguinal and iliohypogastric nerves. Textbooks of anatomy describe a fairly large branch from the twelfth intercostal which supplies the skin of the trochanteric region. On theoretical grounds it might be argued that hypersensitiveness should be encountered very frequently in the trochanteric region, but I have very seldom found it. The usual area of buttock tenderness varies in depth and width. It may be only the size of a finger-tip or it may extend laterally for a distance of 2 or 3 inches and may extend downward to a line about on a level with the tip of the great trochanter. Tenderness extending below this level is much less common and when present is due to involvement of lumbar nerves from the second on down. Meralgia parasthetica seems to be a very puzzling disease to the ones who have written about it, but in my experience it is simply an expression in the second lumbar nerve of the same form of neuralgia as affects the intercostal nerves, and it is often found in association with the latter.

The tests which have been described are usually very valuable in making a differential diagnosis between parietal neuralgia and early peritonitis, but the examiner must keep in mind that under certain circumstances the B test may prove misleading in cases of peritonitis. When peritonitis, either acute or as a local abscess, involves the anterior parietal peritoneum, and particularly if the inflammation having penetrated the peritoneum involves the muscles, tenderness may be elicited even when the muscles are tense in the B stage of the test. Again patients, particularly multiparous women, with very flabby abdominal muscles, may be unable in the B test to tense their muscles adequately to exclude an intra-abdominal tenderness. If these two possible sources of error are kept in mind, a faulty diagnosis can be averted by a careful analysis of the numbered tests and by finding other characteristic evidences of the intra-abdominal lesion. All of the signs of intercostal neuralgia may be associated with peritonitis. Usually, however, in peritonitis the tenderness is limited to the abdominal wall and does not involve the nerve trunks, the buttocks, or the transverse processes of the vertebræ.

For the sake of brevity and for lack of a more suitable designation, I am using the term "intercostal neuralgia" in this paper to include every lesion which can give rise to pain and tenderness in any or all of the twenty-four intercostal nerves and the two first lumbar nerves. In a minor percentage of cases intercostal neuralgia may occur as a disease *per se*, as for instance from exposure to cold such as occurs in the early spring months when boys go in swimming and lie naked on the riverbank exposed to raw winds. As a rule, however, intercostal neuralgia is only a syndrome which may be present in any one of a great variety of lesions which involve the spinal cord, or the intercostal nerve roots, trunks, or terminals. The underlying disease may be an irritative lesion of the sensory tracts in the spinal cord; any form of spinal meningitis, particularly syphilitic and tuberculous; a disease of intercostal sensory nerve roots or ganglia, as in herpes zoster; sarcoma, secondary carcinoma, tuberculosis or syphilis of the vertebræ; various forms of arthritis and osteo-arthitis of the spine; typhoid spondylitis; abnormal curvature of the spine; postural strains of spine; trauma, either direct or indirect to the spinal

region or fracture of ribs; endogenous toxins, as from carious teeth, infected tonsils, upper respiratory tract infections, pneumonia, pulmonary tuberculosis, intra-abdominal foci of infection, infectious diseases, etc.; exogenous toxins, as lead, alcohol, arsenic, antitoxins, sero-bacterines, etc.; and various constitutional affections, as anæmias, blood dyscrasias, syphilis, diabetes, etc. Theoretically, an exhaustive, painstaking examination should reveal evidence of the underlying disease causing the symptoms of intercostal neuralgia in every case. In practice, however, it is often impossible to determine the definite cause and frequently two or more causes may be acting together in any given case.

Intercostal neuralgia is more frequent in women than in men and more common on the right than on the left side, and it may occur at any age. In childhood and early adult life the common cause is toxæmia from contagious diseases, pneumonia, and upper respiratory tract infections and the attack usually persists for only a few days. A more prolonged period of symptoms may result from Pott's disease or lateral curvature of the spine. After the age of 25 or 30 years a greater variety of causes are noted.

The symptoms of intercostal neuralgia may be transient, or may persist over a period of years in which they may be fairly constant, remittent or intermittent or may be subject to repeated exacerbations. The severity of the pain varies greatly in different patients, and often also in the same patient at different times. Exceptionally in the acute cases pain may be so severe that heavy doses of morphine are required for its relief. Usually the pain would be quite tolerable in the chronic cases except for its long duration. Ordinarily the pain does not prevent the patient from working at his usual employment, and his main reason for seeking advice is often due to a fear that the pain indicates some intra-abdominal lesion such as appendicitis, gall stones, or cancer.

When we consider that intercostal neuralgia may exist from only a few days up to several years; may vary in severity from 1 per cent mildness up to 100 per cent vicious severity of pain; may involve any one or several of the twenty-four intercostal and the two first lumbar nerves, and in addition other spinal nerves; and commonly may be associated with symptoms of its causative disease, we can realize the great diversity in the clinical pictures presented by these patients.

Intercostal neuralgia in so far as it affects the abdominal wall is commonly not recognized and is generally and erroneously regarded as an evidence either of an intra-abdominal lesion or of some vague neurosis. Abdominal tenderness due to intercostal neuralgia is usually not demonstrated by the customary method of palpation with relaxed muscles (A test) until the examiner's fingers have dipped more or less deeply into the abdomen. Because of the deep position of his fingers, the examiner subconsciously comes to the erroneous conclusion that the tenderness is deep seated and is caused by an intra-abdominal, gynecological, or genito-urinary lesion. Palpation by the B test with the abdominal muscles made tense would prevent this error and demonstrate the parietal location of the tenderness, and then further examinations along the lines indicated would reveal additional evidences of intercostal neuralgia. As a rule, the area of abdominal tenderness in intercostal neuralgia is too widespread to be accounted for on the basis of a lesion of a single viscus in the absence of a complicating peritonitis but this fact is commonly overlooked and failure to employ the B test is apt to result in an operation for a non-existent lesion in the viscus which lies immediately beneath the point of maximum parietal tenderness. If the pain and tenderness are of recent origin and fairly severe they are often due to the toxæmia of a late stage of a respiratory tract infection which may still be causing fever, tachycardia, and leucocytosis. If, as usually happens with intercostal neuralgia, the pain and tenderness are right-sided, an emergency appendectomy may be performed on an appendix which does not show any present signs of active disease but the surgeon may theorize that it was kinked or otherwise vaguely diseased to account for the acute symptoms. The patient has a somewhat stormier convalescence than the ordinary clean appendectomy, but inasmuch as his respiratory infection is past history, the

toxic intercostal pain and tenderness promptly subside within 3 to 7 days and the patient is believed to have been cured of his parietal pain and tenderness by the appendectomy.

It is the patients with intercostal neuralgia in a chronic form who constitute the majority of the cases that are subjected to gastro-intestinal X-ray studies and who are mainly responsible for 90 per cent of all gastro-intestinal X-ray examinations proving negative. These same patients are subjected to test meals, bile drainage, cholecystograms, cystoscopies, ureteral catheterizations, pyelograms, vaginal and proctoscopic examinations and various laboratory tests of urine, blood, fæces, spinal fluid, etc., in the vain effort to discover the cause of pain and tenderness which are in no way dependent upon an intra-abdominal lesion. If, as commonly happens, all these examinations prove negative the patient is either subjected to a futile exploratory laparotomy or is discharged from the hospital with advice as to treatment which proves barren of results and the patient then starts on his career of entering hospital after hospital to have expensive examinations repeated time after time. On the other hand if examination reveals an intra-abdominal lesion its operative correction will very seldom exert any influence upon the course of the intercostal neuralgia and the patient will complain of the same pain and tenderness after operation. During the first few days after operation the patient is reassured by being told that his symptoms are due to the transient pain and soreness of the wound but as he continues to complain up to the minute of his discharge from hospital he is lucky if he escapes the stigma of being called a "neurotic." A persistence of the same pain and tenderness for many months induces the patient to seek another hospital where the various intra-abdominal examinations are repeated and all of them proving negative the patient is operated upon for "adhesions" which are seldom found and the intercostal pains and tenderness continue unabated. If the patient is a woman she is quite apt to have three operations, first an appendectomy, then a salpingo-oöphorectomy and then an operation for adhesions. Thereafter she follows after strange cults, becomes a dope fiend, or, if pains are unusually severe, commits suicide. Much time, trouble, and expense can be saved patients, physicians, and hospitals by spending one minute in employing the A and B two-stage test as a part of the routine examination of all abdomens in which tenderness is encountered. The A and B test in cases of intercostal neuralgia will immediately disclose the fact that the tenderness is parietal and that, after exclusion of a possible peritonitis, further examinations should be conducted to discover the underlying cause of the nerve lesion rather than to hunt for an intra-abdominal lesion which is not likely to be found, or if found is almost certainly not the cause of the parietal pain and tenderness.

I believe that the teaching of Sir James Mackenzie and his followers that pain and tenderness of the abdominal wall should be regarded as a visceroparietal reflex indicative of an intra-abdominal lesion has resulted in many erroneous diagnoses and needless operations. Mackenzie believes the intra-abdominal viscera, which are not supplied by nerves of pain sense and therefore when diseased cannot manifest pain in themselves, will, when diseased, send stimuli over a sympathetic branch to the spinal cord and create therein an irritable segmental focus with the result that the normal afferent impulses coming from the skin and muscles over the intercostal nerve to that irritated spinal segment will give rise to painful impressions which are in turn referred over the intercostal efferent fibers to the peripheral tissues. Mackenzie and his disciples have focussed their attention upon the comparatively small abdominal area of spontaneous pain and localized tenderness as described under (2) the pinch test and (3) the superficial skin tests and they have failed to realize how widespread the intercostal nerve involvement may be in these cases as shown by tests 4, 5, 6, and 7. They believe the maximum point of parietal tenderness is an index to the particular viscus which is diseased. I have tried out their theories and I have been unable to convince myself of the correctness of their views in the vast majority of cases that come under my observation. Their views may hold good in exceptional cases as, for instance, in gastric or duodenal

ulcer in which a dime-sized area of tenderness is sometimes found near the midline in the epigastrium without other coincident signs of intercostal nerve lesion. Late peritonitis may also cause parietal tenderness limited to the abdomen, and the tenderness may be present even when the muscles are tense in the B test, but as a rule the nerve trunks, buttocks, and vertebræ are then not hypersensitive. These types of cases, however, are rare as compared to the very common cases of widespread pain and tenderness due to intercostal neuralgia. I believe that further careful study of cases will demonstrate that (1) certain intra-abdominal inflammatory lesions may cause parietal tenderness either by toxæmia or by involvement of the abdominal wall; (2) the visceroparietal reflex is at most a very infrequent manifestation; and (3) the usual cause of parietal pain and tenderness is intercostal neuralgia independent of an intra-abdominal lesion.

In exceptional instances a suppurative intra-abdominal lesion other than peritonitis may cause parietal neuralgia but it is then the result of a local manifestation of the constitutional toxæmia rather than the expression of a visceroparietal reflex and the chances are about equal that the parietal neuralgia will be on the side opposite to the suppurative lesion. I believe Mackenzie and his disciples have the cart before the horse when they assume that an intra-abdominal lesion must be the cause of parietal pain and tenderness in every case. Acting on that assumption they operate to remove a chronic appendix or chronic gall bladder and because the microscope reveals chronic disease they regard their case as proven, whereas a follow-up on these cases all too commonly shows a recurrence of pain and tenderness after the patient resumes normal activities. The real test in these cases is not what the microscope shows but whether or not the operation relieved the patient of the parietal pain and tenderness for which he sought treatment. The majority of cases of intercostal neuralgia occur beyond midlife at a time when various forms of intra-abdominal pathology have made their appearance and can be demonstrated by exhaustive examinations or by exploratory operations, but the mere presence of such pathology does not prove it is the cause of the intercostal neuralgia. Cases are all too numerous in which repeated intra-abdominal operations have failed to cure the neuralgia. Intercostal neuralgia and any intra-abdominal lesion may coexist just as a wen of the scalp and an ingrown toenail may coexist in the same patient, and except for their geographical proximity they are usually just as independent of one another as regards cause, diagnosis, prognosis, treatment, and ultimate results, as are the wen and the toenail. In any case of intercostal neuralgia, it may be a difficult question to determine whether or not there is a coexistent (although independent) intra-abdominal lesion, but a careful consideration of the history, symptoms, physical examination, X-ray and laboratory findings will lead to a correct diagnosis.

Because of inadequate or misdirected examinations many patients with intercostal neuraglia are labeled neurotics or some similar opprobrious epithet just short of fakir or malingerer and receive but scant attention from physicians and hospitals. A large percentage of these patients are neurotic but that does not excuse the failure to diagnose and treat their intercostal neuralgias. On the other hand the failure to diagnose the cause of long standing abdominal pain and tenderness and the lack of interest shown in treatment are enough to make them "neurotic."

It is a surprising fact that patients with symptoms of long duration as a rule do not attempt to exaggerate their symptoms in the hope of securing more attentive treatment. That their pains are real is evidenced by their willingness to undergo operation after operation in the hope of obtaining relief from their prolonged pain and tenderness. In my experience nearly all the patients who have multiple abdominal scars and are still complaining of abdominal pain and tenderness present definite signs of intercostal neuralgia.

An examination of a patient along the lines indicated in the earlier part of this paper promptly substantiates the claims of the real sufferer and exposes the malingerer, because the latter's efforts soon reveal glaring discrepancies between his claims and the anatomical

distribution of his nerve supply. The severity, extent and location of the pain and tenderness in intercostal neuralgia are extremely variable at different times and this variability has been assigned as additional evidence of the patient being a neurotic or semi-malingerer. It has been my experience, however, that these variations as claimed by the individual patients are entirely consistent with the physical findings, particularly from the anatomical standpoint. It is not unusual to see a patient's pain and tenderness entirely disappear as the result of two or more days of rest in bed and then recur shortly after getting out of bed. The spontaneous pain and the nerve trunk tenderness disappear before the nerve terminal tenderness in those cases in which the symptoms subside while under observation. Patients are commonly worse after physical activity, but on the other hand I have occasionally seen mild localized symptoms become severe and widespread on confinement to bed due probably to a mattress or springs which caused harmful strain on the vertebral column. I have seen a patient in such severe pain and exquisite tenderness from intercostal neuralgia despite large doses of morphine that he attempted suicide by jumping out of a sixth story hospital window in the evening, and yet on the following morning his pain was entirely gone and his tenderness was barely demonstrable. An intercurrent toxæmia is prone to cause an exacerbation of symptoms in chronic intercostal neuralgia. All these variations in symptoms are due to the vagaries of the disease and are not to be regarded as evidence of the patient being a semi-malingerer.

With all its numerous ramifications intercostal neuralgia is a rather complex disease or more often a symptom-complex encountered in many different diseases but its signs and symptoms are so characteristic that the diagnosis can be made readily, provided the examination of the patient is conducted along the proper lines.

The limits of this paper prevent my quoting from the literature, citing illustrative cases and dealing with the treatment, but I hope to write on these phases of intercostal neuralgia in the near future.

THE INTRAVENOUS ADMINISTRATION OF MERCUROCHROME

By HUGH H. TROUT, M.D., F.A.C.S., Roanoke, Virginia

BEFORE one enters into the discussion of the therapeutic value of any drug or chemical, not only a study should be made of the article to be employed, but, more particularly, consideration should be given to the manner in which the supposed beneficial effects are to be obtained.

Experiments with dyes were undertaken partly because of the failure of hexamethylemin (urotropin) to meet expectations as a urinary antiseptic. With the hope of making a compound of phenolsulphonephthalein which would act as a genito-urinary germicide, Dr. Hugh H. Young began his experiments and, as a result, mercurochrome-220 was evolved after much research. In this work Dr. Young was assisted not only by his associates at the Brady Urological Institute, but also by numerous chemists and bacteriologists.

There can be no question of the thoroughness with which this work was done, nor can anyone, knowing Dr. Young, doubt for one moment his sincerity, but, we do have the right to question whether his enthusiasm has not allowed him to attribute to this dye beneficial effects which are, perhaps, not results, but merely coincidences. I am sure, with this in mind, Dr. Young has made a very earnest and tremendous effort to obtain reports from numerous sources, both as regards the bad, as well as the good results, and to those of you who are particularly interested in such a collection of cases, you will find a most comprehensive report of 213 cases in the *Archives of Surgery*, May, 1925. In the same article there is a description of the dye, its history, and other interesting data.

In considering the manner in which the supposed beneficial results are obtained, it is first necessary to outline one's conception of septicæmia, and this has been wonderfully done in a paper read before the American Surgical Association by Dr. Walter Martin and published in the September issue of *Annals of Surgery*. Naturally, in the consideration of this many-sided problem, two questions promptly arise:

1. Does a blood stream infection spread in the same manner as does an infection in cellular tissue?

2. Is it possible to kill micro-organisms with a dye or any other substance and at the same time not harm living cells?

In the answers to these questions will be found the justification, or non-justification, for the continuation of intravenous medication.

It has been repeatedly demonstrated that if India ink, lamp black, or any other inert substance be injected in the blood stream, it will soon disappear from the peripheral circulation and may be found in localities in which the circulation is retarded, as for instance in the capillary mesbwork of the spleen, the liver, and the bone marrow. (The dye is not excreted by urine or bowel.) In these localities the dye is taken up by cells of the reticulo-endothelial system. These cells are known to have great phagocytic power, as well as a reaction to certain vital stains. The relationship of these cells to antibody formation is most interestingly presented in an all too short article by Gay and Clark in the *Journal of the American Medical Association*, October 25, 1924. Oppenheimer and Fishberg in the *Archives of Internal Medicine*, November, 1925, present a most instructive study of "Lipemia and Reticulo-Endothelial Apparatus." Martland, Conlon, and Knef in the *Journal of the American Medical Association*, December 5, 1925, demonstrate by means of an electroscope deposition of radio-active elements in the phagocytic cells of the reticulo-endothelial system in a paper the title of which is "Some Unrecognized Dangers in the Use and Handling of Radio-active Substances." This, however, is neither the time nor the occasion for such speculation, further than the statement that it is my belief that the solution of any problem in intravenous medication and sterilization will be most intimately concerned with these very cells.

In this respect what is true as to the injection of dyes is also true as to the injection of bacteria into the blood stream. However, as a rule, we do not have a sudden injection of bacteria into the blood stream; usually there is a slow leak of micro-organisms from some focus of infection, so that the blood stream is thus afforded an opportunity to develop bactericidal substances with which to combat the toxins.

There are times when the peripheral circulation is free from bacteria while the spleen, liver, bone marrow, etc., may be full. In other words, it is perfectly possible that peripheral blood cultures be negative at one examination and a few hours later show many colonies. In addition, it is reasonable to assume that there are instances when the peripheral blood stream will show a fluctuation from numerous colonies to a negative culture, for it is a generally accepted fact that bacteria are to be found in the peripheral stream in "showers" and between these "showers" no bacteria will be found. If such a hypothesis be true, then one cannot, with any great degree of certainty, attribute the sterilization of the blood stream to any chemical unless we obtain a method of centrally examining also the blood in such organs as the spleen, liver, etc. Such examinations in the human being, at least, are, of course, out of consideration, and because of the difficulty of such examination in animal experimentation the results are also very uncertain and unsatisfactory.

Dr. George B. Lawson directed the following experiments which were carried out by the resident staff and laboratory personnel of the Jefferson Hospital, Roanoke, Virginia.

A series of four control rabbits of approximately the same size and weight received from 1 cubic centimeter to 1/10 cubic centimeter of a 24 hour culture of streptococcus hæmolyticus. This particular culture of streptococcus hæmolyticus was obtained from the University of Pennsylvania, for, in order to have the experiments uniform, it was necessary to have some organism which would be constant in its power to produce fatal results. The injections were made into the posterior auricular vein and the animal died in from 6 to 48 hours. A similar series (4) injected with 1/100 cubic centimeter of whole heart's serum obtained at autopsy and injected in the same region also died in the same period of time. All of the rabbits used in the entire experiment weighed from ½ to 3 kilograms, though, of course, rabbits of like size were taken for each corresponding experiment.

Four control rabbits received 7½ milligrams of mercurochrome per kilogram of body weight. They received no streptococci but died in an average of 72 hours.

In three series of four rabbits each, 5 milligrams, 3 milligrams, and 2.5 milligrams of mercurochrome per kilogram of body weight were given respectively in each series, but without streptococci. All lived.

In two series of four rabbits each, two and later three intravenous injections of 3 and 2.5 milligrams of mercurochrome were given at 4 hour intervals. All lived.

Two rabbits each received 2.5 milligrams of mercurochrome and in addition each was given intravenously 1/100 of a cubic centimeter of whole heart's serum obtained at autopsy from infected animals. Both succumbed in 12 to 24 hours.

Two rabbits receiving 3 milligrams of mercurochrome per kilogram with 1/100 of a cubic centimeter of infected serum died in from 12 to 24 hours.

Another series of two received the same amount of infected serum with few blood cells, and 2.5 milligrams of mercurochrome per kilogram. The latter was repeated in 4 hours. The animals died in about the same length of time.

A similar experiment was conducted with 3 milligrams of mercurochrome per kilogram and the latter was repeated in 4 hours with the same result.

Again, rabbits (two series of two each) were injected with the same amount of serum. This time the mercurochrome (2.5 and 3 milligrams respectively per kilogram) were given at the time of injection of serum as above, and repeated both at 4 and 8 hour intervals but with a similar result.

Finally, a series of eight rabbits was used. Six were given 1/100 cubic centimeter of in-

fected serum. Four of these as well as the two controls which had received no streptococci were given mercurochrome at ½ hour intervals over a period of 10 hours until 5 milligrams had been given per kilogram of body weight. All of the rabbits receiving streptococci died within 24 hours. Those receiving the mercurochrome alone, survived.

From these experiments it may be concluded that doses of mercurochrome exceeding 5 milligrams per kilogram body weight were fatal to rabbits; doses of 2.5 to 3 milligrams alone or repeated did not apparently affect the health of the animals.

In virulent streptococcus infections, mercurochrome, whether given in massive doses or small repeated doses, had little or no effect in checking or altering the course of the infection, or in preventing its fatal termination. However, Dr. Young reports in his clinical review of cases, recovery in 9 out of 11 patients who had streptococcus hæmolyticus septicæmia and who were given mercurochrome-220. This would certainly tend to discredit our work on animals in which the blood stream had been infected with the same organism.

Because of the virulence of the streptococcus hæmolyticus and the rapid spread and fatal termination of infection produced by it, it was decided to duplicate as closely as possible the above work with organisms of lower virulence.

A strain of staphylococcus aureus isolated from a blood stream infection in a child and a strain of bacillus coli isolated from human fæces were the organisms selected. One, two, and three cubic centimeters of a 16 hour broth culture of staphylococcus aureus were injected in three series of 3 rabbits each as in the preceding experiment. These rabbits received no mercurochrome, but the above amounts injected were not sufficient to cause death.

A similar series was injected with bacillus coli, with similar results.

On account of the above results, additional series were injected with 5 and 8 cubic centimeters respectively, of the same aged culture of the staphylococcus aureus. The results indicated that this organism was not of sufficient virulence for further use and for this reason the bacillus coli was used to complete the experiment.

By using 8 and 10 cubic centimeters of a 16 hour broth culture of bacillus coli with varying doses of mercurochrome as in the experiment with streptococcus hæmolyticus, it was found that in single doses mercurochrome had no apparent effect in checking the progress of the condition.

Repeated doses of 3 and 5 milligrams of mercurochrome per kilogram administered 4 hours after the injection of bacillus coli and the former repeated once 4 hours later seemed to indicate that this method of administration especially in 5 milligram doses was more efficacious than single doses in any of the amounts used.

Fractional doses of mercurochrome at 30 minute intervals, beginning 4 hours after the injection of bacillus coli and continuing for 10 hours, were now given in 5 series of rabbits. These animals received a total of 5, 7.5, 10, 15, and 20 milligrams respectively, over the 10 hour period.

The results indicated that mercurochrome in this method of administration was more efficient in the larger doses than it was in what previously had been thought to be therapeutic doses for rabbits.

To prove that the deaths were not due to a foreign protein reaction, a rabbit considerably smaller (1/6 kilogram) than those used in the balance of the experiment was injected with 8 cubic centimeters of sterile broth. This rabbit showed no ill effects whatsoever and appeared absolutely normal on autopsy.

From the second series of experiments it may be concluded that:

1. Mercurochrome given in single doses of 2.5, 3, and 5 milligrams per kilogram, 4 hours after the production of a colon septicæmia in rabbits seemed to have little apparent effect in checking the progress of the condition.

2. Mercurochrome given in 3 and 5 milligram doses per kilogram, 4 hours after the production of a colon septicæmia, and the dose repeated at the end of 8 hours, seemed to check the progress of the condition in that the rabbits, appearing to be very sick, eventually recovered.

3. When given at ½ hour intervals over a period of 10 hours, mercurochrome seemed to check the progress of the condition, especially in total doses of 15 to 20 milligrams per kilogram body weight.

It was now thought advisable to determine the effect of mercurochrome alone on various internal organs. We repeated some of the experimental work done by Dr. Hugh H. Young and arrived at very similar results.

Rabbits were given intravenous injections of 2.5, 5, 7.5, 10, 15, 20, 25, and 30 milligrams per kilogram of body weight, and sacrificed at the end of 24 hours. Their kidneys, livers, and spleens were studied microscopically.

Following doses up to and including 7.5 milligrams per kilogram, the only pathological finding was a cloudy swelling of renal epithelium and liver cells. This was variable and occasionally severe.

After the larger dosages, the pathological changes were of the same character but very much more severe, amounting to a coagulation necrosis. In the kidney these areas of necrosis were not confined to the cortex, but frequently extended down into the medulla, while in the liver the necrosis began in the region of the interlobular vessels and extended for a variable distance into the liver lobules. Mercurochrome staining of the tissues was observed after the larger doses.

When one considers that the ravages of syphilis are usually checked by the proper intravenous administration of some of the arsenic derivatives (neo-arsphenamine), the course of malaria most frequently halted by the giving of quinine, and, perhaps, the progress of pneumonia shortened by the use of optochin, one should, at least, be encouraged in looking for some drug which when given intravenously might influence favorably blood stream infections. Of course, neither the spirochætæ of syphilis nor the plasmodium of malaria are true bacteria, but their relationship is sufficiently close to give encouragement in this research work.

After all, *how* a drug acts concerns the patient very slightly and frequently his physician less, but, what we want to know is, *does* it obtain good results, and I only wish the few cases in which we have tried mercurochrome-220 could serve to give us the confidence in the beneficial effects of this dye we would like to have.

In the report by Drs. Young, Hill, and Scott, there are 213 cases from the various parts of the world, many reading like miracles, a few apparently complete failures. The report, as a whole, however, gives one the impression that there must be some definite value to mercurochrome-220, for certainly the percentage of recoveries from different types of blood stream infections in desperately ill cases is very much higher than could be attributed merely to coincidence.

I will not bore you with a detailed account of our 14 cases further than to say that at least six of them recovered. In these cases we believe that mercurochrome-220 was of definite benefit. These six cases were as follows:

Case 1. Septicæmia following tonsillitis and thrombosis of jugular vein. Streptococcus.

Case 2. Puerperal septicæmia. Blood culture: streptococcus; diplococcus.

Case 3. Puerperal septicæmia and pneumonia. Blood culture: streptococcus. Pleurisy with effusion.

Case 4. Gunshot wound of chest. Gram positive cocci, mostly diplococci.

Case 5. Puerperal sepsis. Gram positive cocci tending toward diplococcus and streptococcus grouping. Probably non-hæmolytic streptococcus.

Case 6. Multiple osteomyelitis. Small gram positive diplococcus.

Four out of the 14 patients died and in these mercurochrome-220 apparently had no effect on the progress of infection. These cases were as follows:

Case 1. Gunshot wound with a streptococcus blood stream infection.

Case 2. Spreading peritonitis following appendicitis. Blood culture: streptococcus.

Case 3. Multiple osteomyelitis and epiphysitis with negative blood culture.

Case 4. Streptococcus infection following an abscess of tooth.

The remaining four cases we do not feel were influenced one way or the other by mercurochrome-220. They all, however, went on to recovery, whether due to, or in spite of, mercurochrome-220 I do not think anyone can state with any degree of accuracy.

All of our cases had some reaction. One patient had a slight griping pain in the abdo-

men and one had twenty-five bowel movements in one 24 hour period and many of these stools showed considerable blood. The last mentioned patient recovered. None of our cases was given over 5 milligrams of mercurochrome-220 to the kilogram of body weight. All 14 cases showed an increase in the amount of albuminuria and the number of casts after injections of mercurochrome-220.

Unfortunately, there is no record in the hospital of the number of cases of blood stream infections which recovered without mercurochrome-220. This is due to the fact that until Dr. Young's report, blood cultures were not generally made, for up to that time no very definite attempt had been made toward blood stream sterilization.

There are three dangers to the intravenous use of mercurochrome-220: First, and, by far the greatest, the overlooking in our zeal to "try out" the drug, of something which should be done surgically, such as the opening and draining of some secondary abscesses. This, however, should not be charged against the dye, but is simply mentioned here because I have seen several such cases, and this is unquestionably a distinct danger. Second, the reaction following the intravenous administration of the dye. This might be sufficient to terminate the life of a patient already nearing an end, though I have personally never seen a case in which I thought this was true. It is probable that there are lesions produced in the liver and other viscera by mercurochrome-220, in addition to those due to the infection, which are permanent and detrimental to the future health of the patient. Third, and this too should not be added to the debit side of mercurochrome-220, the indiscriminate giving of the dye by physicians who are not in position to obtain blood cultures, etc. Certainly all intravenous medication has great potential dangers and should not be given except in well equipped hospitals.

Extremes are always dangerous and the middle ground is usually safe, and such I believe should be our attitude toward the giving of mercurochrome-220, intravenously.

Finally, if I were asked to give my own personal view briefly, I would state:

Given a patient with a positive blood stream infection, in whom all possible foci had been removed, mercurochrome is worth a trial. At least, it gives us one more thing to do in these otherwise hopeless cases, and even if it is of no benefit to the patient, this will often prove of some comfort to the family. I do not believe, however, that all the claims made for it as a blood stream sterilizer are as yet proved, and mercurochrome, like any other substance, should not be put in a vein "unadvisedly or lightly."

ACUTE INTESTINAL OBSTRUCTION DUE TO MALIGNANCY[1]

By FRED W. RANKIN, M.D., F.A.C.S., Lexington, Kentucky

ACUTE intestinal obstruction superimposed upon malignancy represents a dual condition, both factors of which are potentially lethal. The statistics of a large series of cases of acute obstruction from all causes will show that carcinoma of the colon is second to carcinoma of the stomach in incidence in intra-abdominal malignancy, and is the etiological factor in acute intestinal obstruction in a very large percentage of cases. Better borne clinically than an acute obstruction in the small intestine because of the less rapid production of acute chemical intoxication resulting from absorption of toxins produced in the obstructed bowel loop, acute colonic obstruction is usually less fulminating in its manifestations, and consequently, later diagnosed.

Burgess analyzed all cases of acute intestinal obstruction admitted to the Manchester Royal Infirmary over a period of 10 years. In a total of 66,373 surgical admissions he found 1,278 cases of intestinal obstruction including large and small intestine cases. In a total of 485 cases of malignant growth of the large intestine he found 173 cases of acute intestinal obstruction. This series, with that of Corner, who reviewed the cases of malignant obstruction admitted to St. Thomas' Hospital over a period of 11 years, and that of Miller who reviewed 129 cases of cancer of the colon, 25 of which were admitted to the hospital for acute intestinal obstruction, is the largest series recorded, but numerous smaller groups of cases show a corresponding percentage of incidence, location of growth, and extent of disease found at operation. Burgess' analysis showed that his colonic group represented 35.6 per cent of 485 cases of malignant growth of the large intestine; and that in the cases of intussusception, the colon was concerned in 364 cases (28 per cent of the group), while excluding intussusception, the colon was involved in 199 cases, 17.8 per cent. I quote Burgess' paper: "We may say that if, in any given case of acute intestinal obstruction, we can locate the site of the obstruction to the colon, and can also exclude strangulated external hernia and intussusception as the cause, then there remains a 91.04 per cent chance of the condition being due to a malignant growth, or roughly, a 9 to 1 chance." His series showed that acute obstruction occurred in the right colon in 13 per cent and in the left colon in 87 per cent.

With the exception of the rectum the sigmoid flexure is the most frequent site of cancer in the large bowel. With about one-third of the colonic malignancies occurring in this segment, approximately one-half of the acute obstructions are found in this location. The cæcum shows an incidence second to the sigmoid in location of growths, but is far less frequently the site of obstruction (6.3 per cent). This is due to several factors. The growths of the right colon are cellular, soft, given to ulceration, and produce symptoms of anæmia, intoxication, and dehydration from absorption and loss of blood rather than from obstruction. Intussusception occurs frequently in this segment and occasionally volvulus associated with malignancy produces an acute obstruction. When the latter condition occurs, invariably there is an abnormally long mesentery to the right colon which is continuous with that of the small bowel furnishing the necessary mechanical factors for twisting.

Colloid carcinoma occurs frequently in the right segment of the colon, 22 per cent of Parham's 72 cases in which the cæcum and ascending colon were involved being of this variety. The transverse colon, which is second to the sigmoid as a site of acute obstruction, showed 7 per cent of 165 cases of the colloid variety; while the sigmoid showed only 4 per cent of 138 cases.

Sarcoma of the ileocæcal coil occasionally is the underlying factor in an acute right sided colonic obstruction. I reported last

[1]Read before the Southern Surgical Society, Louisville, Kentucky, December 16, 1925.

year a case of ileocæcal sarcoma producing acute obstruction by intussusception, upon which I operated as an emergency under the impression that the pathological condition was due to an appendiceal abscess. Resection of the iloecæcal coil was followed by operative recovery, but a recurrence was noted at the end of 6 months.

The mechanical obstruction produced by carcinoma differs from that produced by sarcoma. Sarcoma arising in the lymph follicles of the bowel extends into the mucosa and other coats, except the peritoneal covering, by a progressive growth which is rarely perforative. Ulceration of the mucosa takes place late, although it occurs in a relatively high percentage of cases. The bowel proximal to the tumor is dilated because of the paralysis of the musculature from the direct invasion of the malignancy, and this dilatation rather than stenosis produces an intermittent obstruction which gradually becomes complete from external pressure. The reverse is true in carcinomatous invasion, the stenosis being produced by direct contraction of the bowel lumen from the signet ring type of growth. One in four carcinomata of the colon are of the annular variety, encircling the bowel lumen. The high incidence of obstruction in the left colon is due to three factors: (a) the type of pathological growth, (b) the character of the normal physiological content of the distal colon, and (c) the more constant fixity of the various divisions and the greater number of angulations which normally occur at the rectosigmoid junction, the junction of the sigmoid with the descending colon, and at the splenic flexure. Normally there is a narrowing of the bowel lumen at these points, which are held more or less rigid or semi-rigid by the close fixation to the abdominal parietes. A sharp angulation is the rule at the splenic flexure and at the other points mentioned, the mobility of the bowel above and below tends to increase the probability of obstruction. The content of the left colon is normally formed and hardened fæces, while that of the right half around to the middle of the transverse segment is liquid or semi-solid and easily passed by stenosis of considerable degree. The pathological characteristics of growths in the two segments differ widely, although adenocarcinoma is present in all colonic cancers. The encircling, constricting, annular variety occurs almost entirely distal to the transverse segment.

Two varieties of acute obstruction occur; one coming on unheralded out of a clear sky in 5 per cent of the cases, according to Miller's statistics. The other, which occurs in the larger group of cases, represents the extension of the chronic process into a subacute obstruction and finally an acute complete stenosis. In the first variety premonitory symptoms are unusual, and the attack is ushered in by fulminating symptoms demanding immediate relief. The second variety usually gives a history of several weeks of indefinite symptoms prior to the development of acute obstruction. Several rather acute attacks may have been passed through, relief being obtained by the use of enemata and purgation. This indicates that a slow stenosis is taking place which gradually becomes subacute, because the bowel contents cannot pass beyond the constriction with the result that traumatism to the mucosa has set up in an inflammatory reaction which causes a complete blocking.

The 4 cases of acute malignant obstruction which have come under my observation in the past 18 months, and which I am presenting, have been the result in 3 instances of carcinoma, and in 1 instance of sarcoma. All represent malignancy of different segments of the colon and in each instance a different operative procedure was instituted. The 3 patients were young, being 27, 30, and 31 years of age, respectively; 1 patient was a woman of 60. The location of the growth was in the splenic flexure in one instance, at the junction of the descending colon with the sigmoid in another, in the central portion of the sigmoid in the third, and in the ileocæcal coil in the sarcoma case. All patients were suffering from acute obstruction on admission. Of the 3 cases of carcinoma, 1 represented an unheralded type of obstruction while 2 were typical of subacute stenosis suddenly becoming acute. In the sarcoma case the obstruction was an acute one due to intussusception. Three of the 4 made oper-

ative recovery, and 1 died from peritonitis following enterostomy.

Case 1. Russell, Ishmael, age 27, male, white, married. A diagnosis was made of carcinoma of the descending colon and acute intestinal obstruction. The complaint was pain in the stomach with nausea and vomiting. The family history was unimportant; the father and mother, 1 brother, and 3 sisters were living and well. One brother died as a result of lockjaw. The personal history, prior to the present illness, was negative except for the diseases of childhood, which he had without complication.

Present illness. The patient was admitted to the hospital on July 20, 1925, with an acute abdominal condition which had been present for 48 hours, but which on careful questioning was found to have existed in a subacute manner for 10 days. Since July 8 the patient had been unable to work because of frequent and severe cramping pains in the abdomen. His appetite was good, he ate three meals per day during this time, and there seemed to be no relation between the food and the pain. He was able to sleep at night and had not been awakened by abdominal distress. The paroxysms had never exceeded 3 or 4 during the day. Forty-eight hours prior to admission to the hospital, after a meal at 6 p.m., pain became very severe, with nausea and vomiting. This gave some relief, but at frequent intervals the paroxysms of pain returned. During the past day he had been in almost constant pain and the abdomen had become distended and uncomfortable; nausea and vomiting had been frequent.

The past history was negative for abdominal symptoms with the exception of one attack of pain accompanied by nausea and vomiting 6 years ago. This attack had not recurred and he knew of no reasonable explanation for it. The patient had always been constipated, and more so recently. The histories of the genito-urinary and cardiovascular systems were negative.

Physical examination. The patient was young and well nourished, evidently in acute pain. General examination was negative except for the abdomen. There was marked distention throughout the entire abdomen with considerable muscular rigidity. Tenderness was elicited in epigastrium and right hypochondrium. No palpable mass was made out. The temperature was 99.2 degrees F., pulse 78, respiration 20, blood pressure 120/80. Because of the patient's muscular development no peristaltic movement could be made out in the abdomen. The blood count showed a high leucocyte count, 22,800, with polymorphonuclears 86 per cent. The urine was high in specific gravity, 1035, showed a trace of albumin, and a large quantity of indican. Microscopic examination was negative.

Operation was undertaken immediately. Through a right rectus incision the abdomen was opened and free fluid blood tinged in character was found. The small intestine which presented at the operative wound was markedly distended; the ileocæcal valve was sought and it was found that the right colon was filled with gas. Exploration revealed an annular carcinoma of the descending colon which was producing complete obstruction. Because of the distention in the small bowel it was thought wise to do an enterostomy instead of a cæcostomy. This was done and a large quantity of fluid intestinal contents were drained out. The patient developed a peritonitis after operation and died on the fourth day.

Autopsy showed the carcinoma in the descending colon close to the sigmoid flexure to be completely obstructing. There was metastasis to the regional lymphatic glands, but not to the other abdominal organs. Death was due to peritonitis.

This case represents a type of subacute obstruction which developed into an acute complete obstruction. At the time of admission to the hospital the large bowel was completely shut off and the question of relieving the complete obstruction was the paramount one. The type of operative procedure undertaken was, I believe, a satisfactory one from the standpoint of judgment, but a break in technique in doing an enterostomy may account for the peritonitis.

This case illustrates the possibility of backward pressure in the colon under acute obstructive conditions, when a way is forced through the ileocæcal valve after a length of time. Normally, the valve mechanism is made tighter by increased colonic pressure because the mucous membrane pouts into the cæcum, and because the consequent constriction of this portion of the ileum with œdema and infiltration makes a plug under obstructive conditions. Evidently, the plug gives way and the liquid content of the right colon is forced back into the small bowel.

Obviously, considerable intracolonic pressure is required in those cases in which anatomical relations of the ileocæcal valve are such as those just described. Often the valve is a mere opening without protrusion of mucosa into the large bowel and no doubt slight pressure from the distal arm will cause a relaxation of the muscle fibers and consequent dilatation of the small bowel.

Enterostomy, I believe, might be accomplished more satisfactorily in many of these cases by dividing the terminal ileum several inches from the valve and putting a tube into each end of the cut bowel, forcing the distal

end into the cæcum through the valve, much after the manner of Brown's ileostomy used for ulcerative colitis. Anyone who has attempted to put a tube into a hugely distended cæcum, which has been obstructed for some time has had the experience of finding the needle holes leak bowel content and the œdematous wet cæcal wall cut through by suture with such ease that it is impossible to make a proper closure and peritonitis is liable to ensue. The thick, heavy small bowel wall however may be handled with much more facility and rarely, I believe, will this occur.

CASE 2. Mrs. W. P. H., age 30, female, white, married, was a housewife. The family history showed the father and mother living and well; no brothers and no sisters. She had been married 7 years, and had 3 children, the youngest being 2 years of age. Menstruation began at 13 years of age, had been regular every 4 weeks, from 4 to 5 days in duration, with moderate pain, and normal amount of flow. The past history, except for childhood diseases, was negative. There had been no former operations.

Present illness. Five days ago the patient developed suddenly symptoms of acute intestinal obstruction. She was seized with pain in the lower abdomen, soon radiating throughout the whole abdomen and accompanied by nausea and vomiting. The bowels were not moved either by enemata or cathartics. She continued to pass gas however until 48 hours ago. Tenderness and rigidity of the abdomen increased, but there was even on admission to the hospital only slight distention. Subsequent to operation no history of constipation or intestinal attacks could be elicited, other than that she had had occasional mild attacks of indefinite abdominal symptoms referable to the stomach and relieved by home remedies.

Except for the abdomen, the general physical examination was negative. The abdomen was slightly distended and symmetrical. There was moderate tenderness and muscular rigidity in all quadrants. On percussion uniform tympany was noted. There was an indefinite mass in lower quadrant apparently more in right side than in left.

Operation was performed immediately, August 10, 1925. Through a low incision the abdomen was opened and the colon was found to be distended throughout its entire length above a mass in the middle of the sigmoid flexure. The palpable mass made out prior to operation was a distended and loaded right colon. The obstruction was due to a malignancy encircling the bowel and completely stenosing it. The type of cancer was the signet ring variety and the growth occupied about 2 inches of the bowel wall. There were no demonstrable metastases. The growth was brought out through the incision as a Mikulicz-Bruns procedure and the abdomen closed. Thirty hours subsequently a cautery hole was made in the proximal loop of bowel and a catheter inserted. This relieved the gas distention immediately and the progress from this point on was uneventful. Six days later, August 16, the second stage of the operation was completed and with cautery the tumor mass was severed.

The pathological diagnosis was adenocarcinoma.

The patient returned to her home in an adjoining state to wait for 3 months before having the colostomy closed.

Despite the favorable operative recovery in this case I deprecate the type of technical maneuver instituted. The operations of exteriorization have, I think, a very limited field of usefulness in malignancy, and in acute obstruction due to malignancy I feel that their employment is distinctly contra-indicated. Such a procedure accomplishes nothing toward the allaying of the symptoms and toxæmia in an acute obstruction, which is the paramount issue in an emergency. To perform a Mikulicz-Bruns operation in acute obstruction is but to multiply the hazards in an already desperate case. It is possible that this type of procedure may occasionally be advantageously employed as a supplement to a cæcostomy, but even here I believe its employment is distinctly limited. It is a temptation always to bring out a loop of bowel which shows a cancer when it is freely movable and may be excised later without invading the peritoneal cavity, but this temptation may be readily overcome by study of mortality statistics which prove that the supposed low death rate incident to this type of procedure is in error as regards immediate operative recovery, while the end-results are influenced in a markedly unfavorable manner by its institution.

CASE 3. Mrs. J. C. B. S., age 60, female, white, married, was a housewife. Her mother died of skin cancer at 75, the father died of senility at 79, a maternal uncle died of cancer. The patient had been married 36 years, and had 2 children aged 35 and 32; there had been no miscarriages. The menopause occurred 12 years ago. The past history was unimportant except for typhoid fever and repeated attacks of tonsillitis. For several years she had had shortness of breath on exertion and occasional attacks of cardiac discomfort associated with weakness and dizziness. The complaint was general abdominal pain and intermittent vomiting for 6 weeks.

Present illness. For 6 weeks the patient had been more or less subacutely ill, suffering with paroxysms

of abdominal pain accompanied by nausea and vomiting, coming on 4 or 5 times daily. The first attack was ushered in with severe pain in the epigastrium, never by nausea or vomiting. The pain was sharp and griping in character and intermittent, and the patient thought she could see a tumor in her upper abdomen during the attack. Her bowels which had long been chronically constipated became obstinately constipated, but were relieved by enemata. Never at any time did she notice any blood in the stool or on the stool. These abdominal attacks had increased in severity and for the past 10 days she had been confined to bed suffering considerable pain, and without a bowel movement despite purgation. She had grown weak and toxic from loss of fluids and had lost 15 pounds in weight during this period. The character of the vomitus had never been fæcal, and had never contained blood, although the odor was offensive.

Physical examination showed an emaciated, acutely ill, elderly lady with drawn face, anxious expression, and flushed cheeks. The abdomen was hugely distended and a tumor mass occupying the epigastrium and right hypochondrium and extending down to the crest of the ileum was visible. The abdominal musculature was poor and observation of the tumor readily disclosed peristaltic waves. Palpation showed the tumor to disappear under the left costal margin and traced it across the upper abdomen and down into the right iliac fossa. The tumor was doughy in feel and evidently contained large quantities of gas and fluid since gurgling was made out readily on movement. Over its entire extent the tumor was hyperresonant. Blood pressure was 110/90, pulse 100, temperature 98. The heart sounds were low pitched and weak, and otherwise the physical examination was negative. The urine was acid in reaction, albumin one plus, sugar one plus, specific gravity 1002. Blood hæmoglobin 70 per cent; erythrocytes 4,000,000; leucocytes 5,700.

Operation was performed September 9, 1925. A high left rectus incision disclosed the transverse colon and cæcum hugely dilated, forming the palpable mass. An annular carcinoma high under the costal margin of the splenic flexure was palpated. Through a separate McBurney incision a cæcostomy was done. It was noted at operation that the cæcum was thick and œdematous and that the semifluid content about half filled it, while the remainder of the distention was due to gas. A large rubber tube about the size of the index finger was used in making the cæcostomy. The patient reacted well, did not vomit again and made an uninterrupted recovery, gaining in strength and weight. The tube drained satisfactorily and was used to irrigate the cæcum daily after first 72 hours.

Secondary operation was done September 24, 1925. The abdomen was opened through the same left rectus incision as that used for exploration. The splenic flexure was mobilized and resected and end-to-end anastomosis was made between the transverse colon and the descending arm. The Parker-Kerr aseptic basting stitch method was used satisfactorily and the anastomosis completed without difficulty. The patient made a good recovery from the operation and was dismissed from the hospital at the end of another 2 weeks.

This type of operation in two stages perhaps represents the most satisfactory method of dealing with these acute obstructions of the colon. A justifiable criticism may perhaps be leveled at the surgeon for even exploring a weakened and devitalized patient suffering from malignant obstruction. Bevin and others have pointed out the advisability of merely relieving the immediate obstruction by a rapid cæcostomy done under local or gas anæsthesia through a McBurney incision, and later carrying out the necessary examination to ascertain the underlying cause which may be dealt with as circumstances permit. The changes in the local condition of the bowel at the secondary operation are impressive, and the lack of œdema and infiltration, plus the general improvement in the physical condition emphasize the advantages of a graded procedure. In this particular location in the splenic flexure obstruction in either acute or chronic form is present in practically every case of carcinoma.

TREATMENT

The treatment of acute intestinal obstruction due to malignancy resolves itself into immediate relief of the obstructed bowel rather than technical maneuvers designed to deal with the underlying malignancy. The high mortality of obstruction is recognized as being a mortality of delay, and as Van Beuren puts it, "The longer the patient with bowel obstruction lives before operation, the sooner he dies after operation." Except in the 5 per cent of fulminating cases, and in the acute cases due to volvulus, intussusception, and strangulated hernia, diagnosis is more apt to be delayed in cases of colonic stenosis than in cases of small bowel obstruction. The time at which diagnosis is made influences the type of operation undertaken and the resulting mortality. The obvious diagnosis of strangulated hernia accounts for the difference in its favor in mortality when

compared with other forms of acute intestinal obstruction. It is unessential to know the exact cause of acute intestinal obstruction before instituting treatment, especially if the obstruction is of any length of standing. Even after the diagnosis of acute obstruction is arrived at, occasionally it is not apparent whether the obstruction is in the ileum or in the large bowel, and even if obstruction is present, whether exploration should be made.

Physical examination of the distended abdomen, plus a careful history, usually indicates the type, nature, and location of the obstruction. If the ileocæcal valve remains competent and does not permit backflow of the intestinal content into the small bowel, usually tumefaction, peristalsis, and outline of the colon indicates the position of the stenosis.

In 2 of our cases the tumor was entirely in the right side, and on examination was found to be in the cæcum and ascending colon, while the obstruction was located in 1 case at the splenic flexure, and in another at the junction of the descending colon with the sigmoid. As Mr. Burgess aptly remarks: "The keynote to the diagnosis is the condition of the cæcum; if it is visibly distended, or failing this, if it can be definitely felt to alternately soften and harden under the examining finger, then the obstruction is distal to it."

When the abdomen is opened the condition of the ileocæcal coil indicates the location of the obstruction. Whether or not exploration or simple drainage should be undertaken, I believe can be answered by the individualization of cases and institution of exploration in those whose general condition seems to warrant it. Mortality statistics indicate clearly that major operative procedures are distinctly contra-indicated. Primary resection in the face of acute obstruction has an excessively high mortality, and is not to be considered favorably in the treatment of this condition. An 85 per cent mortality in resection of the colon for acute obstruction due to malignancy (exclusive of the ileocæcal coil) regardless of the type of technique employed, is prohibitive. Enterocolostomy, colostomy, and enterostomy, are types of operation to be considered with or without exploration. Apparently cæcostomy alone without exploration is the operation of choice in the majority of instances. A blind cæcostomy may result in a volvulus or internal strangulation being overlooked in a small percentage of cases, but Burgess assumes that the increased mortality from overlooked gangrenous intestine is only 1.5 per cent. Cæcostomy has advantages over the other types of operation both as an emergency measure and as a primary step of a graded operation, even in chronically obstructed cases. It permits drainage of the bowel and at the same time may be used as an avenue of medication to reduce the local inflammatory conditions against the time of subsequent resection. It is placed further from the field of secondary operation than is colostomy, and usually requires little or no effort to close after the secondary resection has been carried out.

The Gibson technique we have found satisfactory both because it can be used in emergencies and because it usually closes spontaneously or by a minor maneuver. Through a split muscle incision under local anæsthesia, or local and gas, the cæcum may be rapidly delivered, a large tube placed in it, and immediately siphonage into a bottle at the bedside is commenced.

In acute obstruction of the colon the mortality is more than 30 per cent from a simple maneuver alone, and the percentage rises in direct ratio to the increase in magnitude of the operative procedure and the delay in diagnosis. The acute crisis being past, roentgenography indicates the location of the growth and its extirpation may be undertaken safely at a second stage, when the general and local conditions have been improved.

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LARYNGECTOMY IN ONE STAGE[1]

By J. E. MacKENTY, M.D., F.A.C.S., New York City

SINCE 1908 about 395 cases of laryngeal cancer have come under my observation, 123 of which have been subjected to surgical treatment as follows: thyrotomy or laryngofissure 22, no deaths, 15 recurrences, 7 cures; hemilaryngectomy 6, no deaths, 4 recurrences, 2 cures; total laryngectomy 95, 2 deaths, 15 recurrences.

In 2 other cases in which death resulted from embolus and meningitis 3 and 8 weeks after operation the history is debatable. These cases are fully discussed elsewhere.

All deaths were in diabetics and syphilitic diabetics. There were none in patients with normal blood chemistry. It is most encouraging that in 57 frankly intrinsic cases there have been only 2 recurrences after total laryngectomy. The large recurrence in thyrotomy was due to faulty selection of operation and occurred in the cases treated between 7 and 15 years ago.

Hemilaryngectomy is an unjustifiable operation. Total laryngectomy has been gaining in favor over thyrotomy in recent years.

Operators are divided on the question of the best method for total laryngectomy, between the one stage operation on one hand and the various multiple stage operations on the other. The merits of these methods cannot be discussed here. Personally I have always liked the one stage operation and feel that the results obtained justify this position.

I shall enumerate the principles governing the one stage operation.

The surgical principles involved are the following:

1. A careful study of the patient's general condition and of the metabolism, especially as shown in the blood chemistry. Patients with pronounced and irremediable metabolic imbalance are rejected.

2. Digitalization just prior to the operation in all cases in which cardiovascular degeneration is suspected.

3. Careful dieting and colonic lavage for at least one week preceding the operation.

4. Mouth hygiene. All diseased teeth are extracted and diseased gums treated. Practically all mouths are unclean at the age when cancer occurs. The entire absence of teeth is a distinct advantage.

5. The combination of local and general anæsthesia, the latter not to exceed one-half hour in time.

6. The absolute exclusion of blood from the trachea during operation and of wound drainage after operation.

7. The placement of wound drainage so as to block off extension of the infection into the planes of the neck and the special management of this drainage during the convalescent period.

8. The anchoring of the trachea in the lower angle of the wound and the corking of the trachea to exclude wound drainage during the entire convalescent period.

9. The use of suction for wound cleansing and for clearing the trachea of secretion. Inspissated secretions sometimes lodge at the tracheal bifurcation causing serious embarrassment to respiration. These should be removed with the bronchoscope.

10. The use of the naso-œsophageal feeding tube extending only half way down the œsophagus. This insures a liberal diet from the start.

11. After-care. The dressing and care of the wound should be done by the surgeon himself and not by an assistant or staff doctor probably untrained in this work. All one's experience in the handling of infected wounds is required in forestalling a serious septic invasion.

I would call especial attention[1] to the high percentage of recurrence in all but total laryngectomies, and to the recurrence of the disease in all the extrinsic and in many of the late, apparently intrinsic, cases. The great majority of laryngeal cancers are squamous celled and extremely malignant. Is the present conservative attitude toward laryngology

[1] Abstracted from article in J. Laryngol. & Otol., Edinburgh, 1924.

[1] Read before the Clinical Congress of Surgeons, Philadelphia, October 26-31, 1926.

justifiable in view of this fact and of the extremely radical position adopted in general surgery toward cancer? Does it seem logical to expect results from a partial operation in which only an apparently normal rim of tissue 0.5 centimeters wide, separates the surgeon's knife from the disease? I say apparently, since the cases cited in a former paper show how fallacious may be our preoperative judgment on this point.

The diagnosis should be made on the history, appearance, and the situation of the growth, and on the exclusion of syphilis and tuberculosis. Biopsy is robbing us of our powers of observation and is as open to criticism here as it is in general surgery where it is resorted to only in exceptional circumstances. I have been forced to employ it in only a few instances in 122 cases.

The extent of the growth should not be estimated on the image seen by direct or indirect laryngoscopy, since the upper edge is all that appears for inspection. It would seem quite safe to add two-thirds to what is visible, in forming a mental picture of its size.

Formerly, when in doubt as to the extent of the disease, I advocated opening the larynx for better orientation. I now believe that this should be avoided, since the incision may bisect the growth and disseminate it. Furthermore, this procedure may let blood into the trachea, and if it must be followed by a total laryngectomy, the time consumed adds materially to an already serious and dangerous operation. If doubt exists in the operator's mind, the patient should be given the benefit of that doubt by having the more radical operation done.

It is my conviction that only the most incipient cancers should be treated by any method other than the most radical; and we must always bear in mind that we have but one operative chance to cure the disease. Secondary operations have, at least in my hands, been a failure.

OPERATIVE PERIOD AND TECHNIQUE

The surgical period may be divided into three stages, (1) the preparation, (2) the operation, (3) the after treatment.

1. *The preparation.* The 2 deaths noted in the above series were due to faulty metabolism. One patient was an obvious diabetic, the other gave a history of glycosuria for a short period, 2 years prior to consulting me. After operation the tissue reaction suggested diabetes, and this was confirmed by the finding of a high percentage of sugar in the blood. The lesson learned from this experience leads to the first point in the period of preparation. A metabolist determines the patient's chemical status and, if the metabolism is faulty, he makes an effort to rectify it. If a metabolic balance cannot be established, especially if the blood sugar cannot be brought to a safe limit, operation is refused.

Cardiovascular degeneration, if not too advanced, does not contra-indicate operation. The exhibition of digitalis may be of great value and, if employed, should be completed just before the operation. Special attention is paid to the condition of the digestive tract and particularly the colon. During the week preceding the operation, three colon irrigations are given at two-day intervals. The first one is preceded by castor oil. This should be thoroughly done so that the patient arrives at the operation with a clean colon. During this week a diet low in protein (excluding eggs and sweet milk) is advocated.

All carious and pyorrhœal teeth are extracted and the remaining ones cleaned. Entire absence of teeth augments the prospect of primary union or at least of lesser degree of infection. Morphine, grain ¼ and atropine grain 1/200 are given hypodermically 1 hour before the operation.

2. *The operation.* A combination of local and general anæsthesia is, in my opinion, better than one of these alone. By this method the duration of the general anæsthesia is reduced to one-half hour, an important factor in the resistance of the patient.

If the growth encroaches upon the breathway, the administration of general anæsthesia from the start may increase the embarrassment and necessitate a tracheal opening, before the surgeon is ready. If the patient becomes cyanosed and is not promptly relieved, the consequent lung hyperæmia

may predispose to a postoperative pneumonia. Hence the advantage of laying bare the larynx and the first and second tracheal rings under local anæsthesia, before a general anæsthetic is given. One per cent novocain is used for the preliminary anæsthesia; one-fourth to one-half of 1 per cent for the deeper structures during the operation. To this is added a very minute amount of adrenalin (10 drops).

The T-incision is used. The dissection is carried backward until the larynx and trachea are skeletonized. When hæmostasis is complete and all vessels tied, the patient is given a general anæsthetic. The trachea is now cut across just below the cricoid, or lower if need be, minute care being taken that no blood enters the lumen of the tube. It is an advantage to inject a few drops of a 10 per cent cocaine solution between two rings into the trachea, before dividing it. This allays cough. The larynx is lifted forward and the posterior wall of the trachea is incised down to the œsophageal wall. A rubber tube which fits snugly into the tracheal lumen is inserted into the trachea to a depth of about two inches. This acts as a tracheal extension, turns back the blood, and enables the anæsthetist to continue without being in the way.

The larynx is separated from the œsophagus from below upward to a point behind the arytenoids. It is then allowed to fall back into position and the thyrohyoid membrane is divided so that it opens into the hypopharynx just below the attachment of the epiglottis. Before this is done the anæsthetist or an assistant opens the mouth, sucks out all the secretion, and paints the entire cavity, the pharynx, and the hypopharynx with a 1:200 solution of acriviolet. The nasal cavity is similarly treated. The edges of the opening in the thyrohyoid membrane are grasped and held apart. A yard of folded gauze, 2 inches wide, is stuffed into the hypopharynx and packed upward until it fills the hypopharynx, pharynx, and mouth. At this point a careful inspection is made of the growth. If it is found to be entirely intrinsic, the larynx is removed by cutting as close as possible to the superior border of the thyroid cartilage. The opening thus made in the hypopharynx is small and lends itself better to successful repair. If the disease has approached the top of the laryngeal box or has involved the arytenoid, then more tissue is sacrificed even to the removal of the anterior hypopharyngeal wall, adherent to the posterior surface of the larynx. In several cases 1 to 1½ inches of the anterior part of this wall have been taken away with the larynx, without producing subsequent stricture.

Just before the last stitch is tied in the closure of the hypopharynx, the anæsthetist removes the gauze packing through the mouth. The pharynx and mouth are again cleansed by suction and painted with a solution of mercurochrome (2 per cent). A feeding tube, of a size which will pass through the nose without undue pressure, is introduced through the more open side. When its point appears in the œsophagus, beneath the untied stitch, the surgeon directs it into the œsophagus to a depth of 6 or 8 inches. The point of exit from the nose is now carefully marked and the tube secured to the face.

The last stitch is now tied. If the redundance of the tissue permits, a second layer of stitches is placed over the first in the hypopharyngeal closure. No. 1 plain gut is used.

The trachea is anchored to the skin of the neck by two or three mattress sutures, each passed around a ring and brought out about 1 inch or more from the edge of the wound. These are tied on small perforated lead discs. This steadies the tracheal stump in the wound and relieves the strain upon the stitches which are to unite the skin edges with the mucous membrane of the trachea. These may be omitted if the trachea stands high in the wound. These stitches must be removed on the third day. To make this union more exact the fat under the skin at the wound edges is cut away. This allows the skin to fall more easily into relationship with the rim of the tracheal stump. The skin strip and rim of the trachea are united by interrupted stitches, fine silk, or better, fine equisetene being used. The wound is loosely closed, no effort being made to bring the deeper parts into anatomical order. It is essential to get a primary union at one point —that is, where the two lines of the T cross.

I have observed that if the integrity of this part of the wound can be maintained, the subsequent healing is much more rapid and a hypopharyngeal fistula does not form. If a break occurs at this point, or, if the wound has to be entirely opened to secure better drainage, an effort should be made, as early as seems prudent, to bring back the angles of the T into place.

I am convinced that an apparently negligible amount of blood entering the lungs during the operation may cause serious consequences. It is, therefore, my endeavor to conduct the operation so that not one drop is allowed to pass down the trachea. A double suction outfit in the hands of the assistants and meticulous vigilance on the part of all secure this result. The rubber tracheal extension tubes are in five sizes, from which one may always be selected which will closely fit the lumen of the trachea.

Since I have put behind me the ambition of securing primary union, and have abandoned the usual surgical methods of wound closure with scanty drainage, my postoperative troubles have been materially reduced. Great care in closing the hypopharynx is essential, but, more essential to the life of the patient is a loose closure with abundant drainage of the superimposed tissues of the neck.

Septic infection must be forestalled by placing drainage in its path. My experience has led me to employ 4 small double tube drains wrapped in gauze. The tubes are open only at their distal and proximal ends. One pair is placed in each of the deep pockets at the end of the cross-bar of the T. One is laid on each side, just above the tracheal skin union and extends laterally to the full depth of the wound. They are left *in situ* for 5 or 6 days and kept clean and open by forcing water through one tube and sucking it out through the other. Then one tube is clamped and the salt solution forced out along the gauze about the tubes. Thus both gauze and tubes are cleansed. This is done 2 or 3 times a day.

A large tracheal cannula (36) is wound round with gauze impregnated with bismuth paste. The winding is so fashioned as to form a conical cork. This is inserted into the trachea and should fit it as a cork does a bottle. The object of corking the trachea is to prevent tracheal secretions from contaminating the wound and wound secretions from entering the trachea. It also protects the tracheal skin union. In my hands it has been a very serviceable device, especially later when infection occurs and discharge from the wound becomes profuse. Without tracheal plugging, in the latter condition, lung infection would be almost inevitable. The corking is maintained until healing is complete. The wound is dressed in the usual way. A rubber apron is placed over the end of the cannula to catch the tracheal secretions.

During the repair period of the operation the patient is given little or no anæsthetic. General anæsthesia is imperative only from the time the trachea is opened until the hypopharynx and œsophagus are closed.

3. *After-treatment.* The immediate treatment usual after any major operation is carried out. I will speak only of the conditions peculiar to this operation. It is here that the skill and experience of the surgeon are often taxed to and even beyond the limit. The after-treatment in laryngectomy cannot be delegated to an assistant or a member of the house staff. Painstaking, constant care on the part of the surgeon is the only key to success. If infection occurs, the surgeon must be at least one step ahead of it. I attribute the prohibitive surgical mortality of a few years ago and even more recently to four causes, viz., careless preparation of the patient, prolonged general anæsthesia, the entrance of blood into the lungs during the operation, and mismanagement of the septic infection so common after operation. Another factor may be added. Rectal feeding and drop feeding by the mouth were depended upon prior to my demonstration, many years ago, that the œsophagus would tolerate a permanent tube for weeks. Rectal feeding was one of the greatest fallacies that ever became rooted in the professional mind.

The drains are left in position, if possible, from 5 to 7 days. If they are removed sooner, their replacement becomes almost impossible on account of the œdema of the neck. About

the third day, cleansing of the wound begins. A suction apparatus is attached to one end of the double tube in each drain. Saline solution is gently introduced through the other end. The flow is continued until the wound is clean. This may have to be done several times in twenty-four hours.

The local reaction in the neck is sometimes considerable and may simulate infection. If doubt exists in the surgeon's mind, he would do wisely to extend as widely as possible his drainage openings and keep a sharp outlook for extension along the muscular planes of the neck. If extension occurs, these planes must be extensively opened and drained. Later, if the discharge becomes excessive and if the hypopharyngeal sutures give way, suction to remove saliva and pus is of inestimable value. Tubes are placed at the bottoms of the pockets and through the opening in the œsophagus. These project through the dressing and the nurse applies suction to them as frequently as is indicated. Dakin's solution has been useless in this work since it may find its way into the trachea and cause intense irritation. I prefer a 2 per cent solution of mercurochrome used sparingly.

If, as sometimes happens, tracheitis follows the operation, suction applied through a catheter passed down the trachea unloads it and may prevent gravitation pneumonia. With the larynx gone normal expulsive cough is impossible, hence the inability on the part of the patient to unload his trachea and bronchi. Here suction carefully and properly applied has, in my hands, saved many lives, not only in this operation but in all conditions where the trachea is open and the bronchial tree blocked with secretion. On three occasions a serious asphyxia was relieved by removing dried masses of secretion with the aid of the bronchoscope from the region of the tracheal bifurcation.

Much of our success in piloting these cases across the postoperative period is due to the permanent feeding tube. Nourishment to the point of tolerance discourages septic infection. Of what avail are the feeble efforts of the surgeon against infection in a starving patient? For over 20 years I have used this method of feeding without one untoward result traceable to its use. It is begun just as soon as the anæsthetic period is over. For two days, from one-half to two-thirds the caloric requirement is given, then the amount increased to tolerance.

Any well-balanced diet capable of being reduced to a fluid or semi-solid state may be used. Fruit and vegetable juices are essential and must be added to the dietary as early as possible. Gravitation serves for ordinary liquids; the piston syringe for thicker ones. The patient being propped up in bed, the food is very slowly introduced. After each feeding (which may be once in 2½ to 4 hours) a few ounces of water are passed through the tube to cleanse it. Several times a day the pharynx is cleared of mucous by suction and the mouth and teeth are cleaned with mouth-wash and tooth-brush. Dressings are changed as often as need be to keep the surface of the wound free from secretion. In foul cases the wound packing may require several changes in 24 hours. The patient must be shifted from side to side and encouraged to sit propped up in bed.

Extensive sloughing may be a blessing in disguise. I believe that it has, in several of my advanced intrinsic cases, been a determining factor in the ultimate cure by eradicating hidden cancer infection in the vicinity of the larynx.

The high percentage of recurrences in all but the total laryngectomies observed in my own experience and in that of many of my confrères in America, makes me lean strongly toward the more radical operation.

The low surgical mortality (less than 2⅓ per cent) in my cases is due to the elimination of unfavorable cases and to the modification of general surgical principles to suit this peculiar and difficult field.

Loss of speech is the serious drawback in total laryngectomy and turns many patients toward radium and the less radical avenues of escape. Radium is at present on trial. So far in my experience, it has proved very ineffectual, beguiling many to their death. I have many patients whose whisper can be distinctly heard at close range in a quiet room. One patient operated upon 9 years ago

has acquired loud speech and can talk over the telephone. He can even count up to twenty on one stomachful of air. In some way, known only to himself, he opens his œsophagus, fills his stomach with air and makes audible speech by slowly expelling the air. Three other patients have acquired audible speech since the above was written making 4 in 95. Education along this line would, I believe, result in many more. Several are engaged in large enterprises, which they conduct as successfully as they did before their operation. Some have informed me that their stenographers can take their dictation with ease. They do not complain of discomfort during the cold months, not even in Canada. To protect the lungs against cold dry air, a bulging wire screen covers the tracheal opening and extends several inches down and across the chest. Above this a high soft collar is worn to exclude the external air. The patient breathes the warm moist air coming from beneath the clothing. This simple device has done much to protect the trachea and lungs during the cold months.

The artificial larynx devised by me is being used with success by many of my patients. Through this I hope to remove to some extent the stigma of silence attached to laryngectomy, to brighten the prospect for the victim and to induce him to accept surgery, his only means of deliverance.

The effort to place the surgical treatment of cancer of the larynx on a better basis has been an uphill struggle. There is a widespread feeling in the profession that cancer of the larynx is a hopeless disease. This is supported by the results of operations done in the later stage of the disease in which the victim is made to pass through a double death. Partial removal of the larynx or attempts to remove the growth by thyrotomy or suspension, in cases entirely unsuited to these procedures, have heaped discredit upon the whole procedure. Finally, there has been the failure of the profession at large to realize that prolonged hoarseness in a person of cancer age may be, and very often is, the first sign of danger, demanding immediate intelligent and painstaking investigation by one competent to differentiate between the simple and malignant diseases in this field. If cancer has its inception external to the laryngeal box, its early detection must be of little avail to the victim until more light on this disease is vouchsafed us. In my opinion we are helpless in this situation. Hence the only patients in whom early detection is of importance are those (the intrinsic) in which hoarseness is an early symptom.

I wish in closing to make two statements: (1) In incipient intrinsic cancer of the larynx the outlook is very hopeful if we apply to the cure the same sound sense exhibited by the general surgeon in the treatment of cancer elsewhere in the body. The general surgeon operates radically. (2) The laryngectomized patient is not, as many believe, a surgical curiosity, a derelict, a miserable thing apart from all his kind. He is usually a useful, active citizen, capable of continuing his life's work, of supporting his family, and of realizing, if not to its full extent, at least to a large extent, the joy of living.

The artificial larynx was demonstrated on a patient.

DISCUSSION

Dr. D. Bryson Delavan: It is not my purpose to discuss the different methods at present advocated for the relief of laryngeal malignant disease. Thyrotomy, partial laryngectomy, total laryngectomy for intrinsic carcinoma, radical operations in extrinsic cases, all have their advocates who are able to present impressive arguments in their favor. Radiology has its adherents who are bringing forward highly interesting evidence in support of their views. Positive knowledge however, as to the relative merits of these various methods has not yet been established. It is this fact that I particularly wish to emphasize, and I wish to indicate as emphatically as possible what I consider the only satisfactory way in which it can be attained, namely, through the collective investigation of large numbers of cases in the hands of the most thoroughly competent men. Without a knowledge of the history of laryngectomy it is hardly possible that anyone could realize the importance of what Dr. MacKenty has done in offering this large series of well studied cases.

The story is long and its details are discouraging to a degree which 15 years ago led me to believe that, up to that time, operations in general for the cure of carcinoma of the larynx had in the aggregate materially lessened the sum total of human life, granting that the average duration of life after the disease has become discoverable is about 2 years. Evidently the main idea in the mind of Dr. Mac-

Kenty has been to sweep away the errors of the past and to evolve a system of procedure which should ultimately determine the real value of surgical intervention for the cure of laryngeal cancer. The development of his system has progressed to a point where it may well challenge our attention and respect. One has only to compare the results of the older operators with his, to understand why.

Laryngectomy was first performed by Watson in 1868, about 60 years ago. The operation was taken up by the general surgeons, both here and abroad, Billroth of Vienna being one of the first to employ it in Europe. With the exception of a few cases it was universally unsuccessful. Somewhat later cases were operated upon by laryngologists, who in some instances were more successful than were the general surgeons for the reason that they had a better knowledge of the throat and its functions, and perhaps a more refined appreciation of the delicacy and complicated nature of the parts. The earliest laryngologist thus to distinguish himself was Dr. J. Solis Cohen of Philadelphia, who may well be called the father of successful laryngectomy in the United States. His celebrated case operated on in 1884 included the cardinal points of the best works of today.

The causes of failure were many. Little regard was paid to the proper selection of cases. As a rule, each operator was self-trained, perhaps never having seen the operation performed. Thus he had to make his own way, not seldom at the sacrifice of his first attempts. He was obliged to work in hospitals not adapted to the care of such patients, and was handicapped by untrained assistants to whom, in many instances, was committed the after-care of the patient. His technique was crude or so imperfectly carried out that with the faulty after-treatment small chance was left for the patient to survive. Case after case was lost, seldom any report being made of them, while the few successful ones were widely heralded. Good surgeons tested themselves upon a few cases, and, soon discouraged, abandoned the operation. There was no persistent continuity of effort by individuals. No statistics that could be relied upon were available. How well Dr. MacKenty has met the requirements of the situation, the result of his work abundantly shows.

Thirty years ago I was invited to open a discussion on thyrotomy in the Section of Laryngology at the annual meeting of the British Medical Association held in London in 1895, in company with Sir Henry T. Butlin, Sir Felix Semon, Sir Dundas Grant, and other leading specialists, including Dr. John N. Mackenzie of Baltimore. On that occasion, I tried to lay especial emphasis upon several principles which had impressed their importance upon me; first, the necessity for the correct diagnosis of the growth and wise judgment as to the possibilities of its successful removal; and second, the age and vitality of the patient. He must suffer from no physical defect likely to complicate recovery or seriously annoy him afterward; he should be of a cheerful and courageous temperament, and, finally, his intelligence should be fair and his surroundings such as to make it possible for him to exist with moderate comfort after operation.

With regard to the operator, I said: "To secure the best success the operator should first of all be a surgeon, thoroughly practiced in all that contributes to the making of a good operator; he should have had special training in the surgery of the neck and in the physiology as well as the anatomy of the laryngeal region; he should be a master of aseptic methods, and of good judgment in the after-care of the case; finally, he should have at his disposal the resources of a perfectly equipped and thoroughly well-managed modern hospital of the best class. As the dangers, not only of operation but of the first days after operation are of conceded importance, it is necessary that this part of the case be managed with extreme care. Many a patient has died of a preventable accident whose life would have been spared if he had had the constant care of a highly skilled watcher. As had been first suggested by Solis Cohen and eloquently insisted upon by him, such a case should never be entrusted to the interne nor to the assistant without experience in such matters, but to an attendant no less competent than the surgeon himself, qualified to appreciate the special necessities of the patient and to meet promptly any emergency that might arise. It cannot be insisted upon too urgently that cases of laryngectomy are desperate at the best, both as to immediate and as to ultimate results, and that with our present limited knowledge of the subject, no amount of caution, however great, will avail in preventing a high percentage of failures. With the sources of danger so numerous, so constant, and so subtle, it is impossible for too great vigilance, foresight, or experience to be brought to bear against them, or for the urgency of this demand to be overstated. While fully appreciating the work already done, and recognizing the hopeful outlook of the future, I have emphasized the difficulties, uncertainties and dangers of the situation for the purpose of insisting upon the gravity of the subject and of discouraging the class of effort which has so often been brought to bear upon these cases. Let me beg you," I said, "not to misunderstand the proposition which I am about to offer, but to receive it in the spirit in which it is given, with the largest possible share of humane impulse and of generous breadth of view. . . . I am strongly of the opinion that for a time both the welfare of patients operated upon as well as the interests of science demand that the indiscriminate performance of capital operations upon the larynx should cease. In most great centers there are individual surgeons or groups of operators who are especially well fitted, both as to personal qualification and hospital facilities, for the successful performance of this work, as proved by the records which they have already made. Let such men surround themselves with the proper assistants; let them systematize their efforts and use all

diligence in the perfecting of appliances and methods and in the study of the cases under them; let them keep careful and accurate record of everything pertaining to the history of their work; then, resign to them temporarily the care of as many cases of laryngeal cancer as possible. When a sufficient amount of material has been collected, let them place it upon a substantial statistical basis; and, as one advance after another has been made, let them give to the profession the general results. Under this system we would soon learn whether the radical extirpation of epithelioma is, on the whole, unjustifiable, or whether, as we have the best reasons for hoping, it will have been proved to be a substantial success." The suggestions just quoted were probably too altruistic to appeal to my audience, for it was a decade before any real advance was made. Moreover thirty years ago collective investigation was not considered and the ideas of the Mayo brothers and of Cabot had not yet been announced.

About 20 years ago Professor Gluck, of Berlin, taking up the accumulated ideas of his predecessors, put the ideas in practice and added some of his own. Soon he made his work known and gained a large following. He also gathered a considerable number of cases. It was his custom to operate upon practically all who came to him, apparently little deterred by conditions of great advancement of the disease. At the 16th International Medical Congress, held at Budapest in 1909, he exhibited to us 4 cases upon which he had performed his most extensive operation for the removal of widespread disease of the throat. On one patient there had been a total extirpation of the larynx with removal of affected adjacent parts of the œsophagus, pharynx, tongue, and lymph nodes. All 4 patients had survived for a period of 2 years, and all appeared to be in fair condition. The mutilation in these cases was extensive, the whole front of the throat having been obliterated, leaving a vacant space of surprising extent.

These cases proved the possibility of such radical resections of important parts of the throat; and, secondly, the possibility of prolonging life when carcinoma had progressed so far outside the larynx as to make a simple laryngectomy useless. Undoubtedly, Gluck's most important contribution was the example he gave of the importance of organization and concentration in the carrying on of such work. Imperfect and unconvincing as may have been many of his own results by reason of his high rate of mortality, he contributed a significant precedent.

Fortunately there is another who, appearing before us today presents a system which embraces the best ideas and methods of the past. To these he has added many ingenious improvements of his own. Hesitating to make formal deductions upon insufficient surmises he has waited until the volume of his statistical material has grown to proportions large enough to furnish convincing proof of the actual value of his long continued efforts. In his work as in that of Dr. Quick in the field of radium my ideal of 30 years ago has at last been realized.

From now on it will be conceded that to those best qualified should be committed this work, so that by their well directed efforts they may bring us nearer and nearer to a definite solution of the problems obscuring the subject of laryngeal cancer. Meanwhile they can train up others to follow in their way, surely we are justified in hoping that the experience of the past 60 years has brought the beginning of a new era, full of the promise of better things.

THE CLINICAL VALUE OF THE ERYTHROCYTE SEDIMENTATION REACTION IN SURGERY

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SINCE the work of Fahraeus (6) on the blood of pregnant women, a large number of papers have appeared on the so-called erythrocyte sedimentation reaction. In about 300 reports that have come to our attention, the consensus of opinion is that the test is a valuable clinical adjunct in the following of the course of a disease. Except in certain surgical conditions, which will be discussed later, it has little diagnostic value, the greater field of usefulness being that of an indicator of the degree of toxicity of a pathological process and of the reaction of the patient. Repeated testing of the blood is believed to show the progressive improvement or decline in a patient's condition. The sedimentation reaction has been especially recommended in chronic diseases such as tuberculosis when the patients are kept under observation for a considerable length of time. In such cases it is considered by von Tegtmeier (27), Brinkmann and Beck (2), Delhaye (4), and others to be of greater significance than the temperature chart. It has also been used with equally favorable results in obstetrics and gynecology, surgery, pediatrics, and psychiatry.

The sedimentation reaction utilizes the speed with which red blood cells settle in a citrated column of blood. This is determined either by observing the distance which the cells have settled in a given period of time, Westergren method (28), or, by noting the time it takes for the top layer of cells to reach a certain distance in the container, Linzenmeier method (17). These two basic methods have been subjected to frequent modifications by different investigators so that a comparison of their results is difficult. We have been using a method recommended by Morriss (21) which gives the sedimentation values in volume per cent of the entire column of blood. Our experience with this method in cases of tuberculosis has demonstrated its simplicity and accuracy. The test is made in the following manner:

Into a sterile 2 cubic centimeter Record syringe, a solution of 3.8 per cent sodium citrate is drawn up to the .4 mark. Blood is then aspirated from an arm vein to the 2 cubic centimeter mark, giving a dilution of 1:4. After thorough mixing in small Wassermann test tubes, the samples are taken to the laboratory where the blood is drawn up into long serological pipettes, graduated into hundredths, placed in a suitable rack and the layer of clear plasma observed at the end of 1, 2, and 24 hours and read directly in per cent. The 2-hour reading is the most significant one.

It has been repeatedly emphasized that the usefulness of the test depends upon its frequent repetition during the course of an illness and that single determinations merely represent the momentary state of the individual. For that reason it seemed desirable to study the test in acute surgical conditions and to correlate the clinical findings with the sedimentation reaction.

TABLE I.—FINDINGS IN FIFTEEN CONTROLS AND FOUR PATIENTS

No.	Age	Sex	Clinical Diagnosis and Condition	Sedimentation Per Cent		
				1 hr.	2 hr.	24 hr.
1	22	M	Medical student	1	1.5	17
2	21	M	Medical student	1	2	23
3	23	M	Medical student	1	2	25
4	22	M	Medical student	1	2	29
5	26	M	Medical student	1	2.5	24
6	24	M	Medical student	1	3	25
7	22	M	Medical student	1.5	3	17
8	26	M	Medical student	2	5	29
9	21	M	Medical student	2	5	35
10	23	M	Medical student	5	12.5	36
11	23	F	Hospital nurse	2	5	29
12	25	F	Hospital nurse	4	7	26
13	21	F	Hospital nurse	3	7	34
14	26	F	Hospital nurse	4	10	41
15	25	F	Hospital nurse	5	10.5	40
16	37	M	Gastric neurosis (dispensary case)	1.5	3	26
17	23	M	Dislocation of semilunar cartilage of knee.	2	5	21
18	55	M	Fracture of tibia and fibula, 6 weeks after admission.	2	5	38
19	17	F	Chronic constipation.	4	9.5	39.5

Sedimentation reactions were all within normal limits.

TABLE II.—READINGS IN CASES WITH SEDIMENTATION VALUES FROM 10 TO 20 PER CENT

No.	Age	Sex	Clinical Diagnosis and Condition	Sedimentation Per Cent		
				1 hr.	2 hr.	24 hr.
20	42	M	Tuberculosis wrist, 1½ years duration. Focus excised 2 months previously. Condition good.	2	5.5	34
21	35	M	Nail puncture wound of thenar eminence. No signs of infection.	4	7	26
22	17	M	Fracture fibula. Condition good.	2	9	36.5
23	62	M	Hypertrophy prostate. Questionable renal stone. T. P. R.[1] normal.	3.5	9	37
24	22	M	Tuberculosis of kidney. Nephrectomy 4 months previously. T. P. R. normal. Chest negative.	4	10	30
25	56	M	Carcinoma œsophagus. No signs of toxic absorption. T. P. R. normal. Discharged improved.	4	10	42
26	15	F	Chronic appendicitis. Enteroptosis and congenital adhesions. Appendectomy 8 days previously. T. P. R. normal.	4	10.5	30
27	22	F	Congenital adhesions. Ptosis of cæcum. Exploratory laparotomy 13 days previously. T. P. R. normal.	3.5	10.5	43
28	20	M	Crushing injury to big toe with gangrene of distal phalanx. 12 days after admission. Wound healing rapidly.	4	10.5	36.5
29	70	M	Arteriosclerosis. Senile tremor.	3.5	11	40
30	25	M	Chronic appendicitis. 11 days after appendectomy. T. P. R. normal.	5	13	42
31	58	M	Fracture fibula. Contusions about shoulder. T. P. R. normal.	6	14	30
32	31	F	Hypophyseal tumor. Enucleation of adenoma pituitary 2 months previously. T. P. R. normal. Condition good.	6	14	43
33	16	M	Duodenal ulcer. Red blood cells 3,500,000.	7	15	44
34	52	M	Hæmorrhoids, 20 days after admission.	5	17	37
35	28	M	Osteomyelitis left femur. Removal of sequestrum and curettement 1 month previously. Condition good.	8	17	47
36	70	M	Diverticulum bladder. Multiple renal calculi and left hydronephrosis.	6	17.5	44.5
37	53	M	Fistula urethra and perineum. 5 weeks after suprapubic cystotomy. T. P. R. normal.	5.5	18	40
38	57	M	Chronic prostatitis and epididymitis.	9	18	52
39	34	M	Diabetes mellitus. Thromboangeitis obliterans big toe. Amputation of leg 3 weeks previously. Died of coronary occlusion 3 months later.	6	19	48
40	70	F	Fracture neck of femur. Plaster cast 5 months. T. P. R. normal.	7	19	49.5

[1] T = Temperature; P = Pulse; R = Respiration.

TABLE III.—CASES IN WHICH THE SEDIMENTATION READINGS WERE FROM 20 TO 40 PER CENT

No.	Age	Sex	Clinical Diagnosis and Condition	Sedimentation Per Cent.		
				1 hr.	2 hr.	24 hr.
41	42	M	Chronic osteomyelitis femur, 13 years duration. 7 weeks after curettement and insertion of drains. Wound discharging.	10	20	41
42	56	M	Emphysema and chronic bronchitis. Arteriosclerosis. Dispensary case.	9.5	21	48
43	44	F	Stricture œsophagus following chemical irritation.	11	21	51
44	26	M	Chronic tuberculous epididymitis and cystitis. 2 weeks following bilateral epididymectomy.	7	21	53
45	52	M	Carcinoma larynx. T. P. R.[1] normal.	9	22	54
46	17	F	Hammer toe with superimposed infection. T. P. R. normal.	10	22	50
47	19	M	1 month following appendectomy. Excision of sinus tract 2 months later.	8	23	51
48	15	M	Acute appendicitis subsiding. Temperature 99.6, pulse 100. Appendix removed following day.	9	23	49
49	31	M	Acute appendicitis—11 days following appendectomy. T. P. R. normal.	10.5	25	57
50	32	M	Duodenal ulcer. Pyloroplasty 2 weeks later.	12	26	53
51	38	F	Chronic appendicitis—adhesions about cæcum. 8 days following appendectomy.	13	27	53.5
52	36	M	Nitric acid burn of fingers (4). Debridement of necrotic skin. T. P. R. normal.	15	28	48
53	40	M	Varicosities of hæmorrhoidal veins. Prolapse of rectum. Hæmorrhoidectomy 2 days previously.	14	28.5	51.5
54	24	F	Fissure in ano. Wassermann ++++ Temperature 99.6.	17	30	50
55	60	M	Benign adenoma prostate. Perineal prostatectomy 3 weeks previously. T. P. R. normal.	14	30.5	52
56	49	M	Renal stone. Removed 8 days later. Died of pneumonia 2 weeks following operation.	11	31	51
57	30	M	Cervical lymphadenopathy probably Hodgkin's. T. P. R. normal.	15	31	56
58	49	M	Carcinoma larynx. Died 1 month later.	17	31	54.5
59	19	M	1 day following adenoid and tonsil operation. T. 99.6.	19	34	52
60	46	M	Tuberculous peritonitis. 18 days following exploratory laparotomy. Slight p. m. rise in temperature.	20	36	62
61	21	M	Condition not diagnosed. Dispensary case.	21	37	59
62	62	M	Lacerations about head following accident T. 100.	22	37	54
63	73	F	Fracture femur. 3 weeks after admission.	21.5	37.5	63
64	39	F	Tuberculosis of spine. Plaster cast 2 weeks.	20	38	63
65	66	M	Perineal prostatectomy 9 days previously.	22	38.5	60
66	71	M	Carcinoma œsophagus. T. P. R. normal.	25	38.5	58

[1] T = Temperature; P = Pulse; R = Respiration.

Table I represents the findings in 15 healthy controls and 4 patients. With the exception of Cases 10 and 15, the 2-hour readings listed here are in agreement with those obtained by Morriss on his healthy controls—up to 5 per cent for men and up to 10 per cent for women.

Table II gives the readings in cases with slight increase in sedimentation values up to 20 per cent. The majority of the readings are postoperative or in afebrile cases. The relatively low readings are in agreement with the clinical findings. Of special interest are Cases 25 and 33. In the former, a case of early carcinoma of the œsophagus with few symptoms and no clinical evidence of toxic absorption, the 2-hour reading is only 10 per cent. The case of duodenal ulcer also gave a

TABLE IV.—CASES IN WHICH THE SEDIMENTATION READINGS WERE FROM 40 TO 60 PER CENT

No.	Age	Sex	Clinical Diagnosis and Condition	Sedimentation Per Cent		
				1 hr.	2 hr.	24 hr.
67	53	F	Recurrent spindle cell sarcoma of buttock. Operation 1 year previously. T. P. R. normal.	27	41	62
68	30	F	Carcinoma breast with metastases. Radical excision 3 weeks previously.	23	43	65.5
69	22	M	Fracture tibia and fibula. Open reduction 5 days previously.	24	43	60
70	68	M	Carcinoma tongue with metastases	24.5	43	60
71	69	M	Carcinoma bladder.	27	45	62
72	18	F	Acute appendicitis. 3 days following appendectomy.	27	45	62
73	48	M	Two weeks after inguinal herniotomy. Wassermann ++++. Discharged cured 3 days later.	22	47	62
74	41	M	Condition not diagnosed. Abdominal and gastric symptoms. Red blood cells 2,860,000. X-ray shows questionable duodenal ulcer.	28	48	62
75	57	M	Carcinoma œsophagus. Died 3 weeks later. Extensive metastases.	31	50	64
76	59	M	3 weeks after suprapubic prostatectomy. Wassermann ++++.	47	50	58
77	59	M	Tuberculosis both lungs. Active, progressive.	36	51	64
78	36	M	Multiple fractures. Wounds almost healed. Wassermann ++ ++.	40	52	63
79	25	M	1 day following excision of a pilonidal sinus. T. 99.6, P. 100.	43	55	64
80	63	M	Fracture pelvis. T. P. R. normal.	35	55.5	73
81	70	M	Senile gangrene of feet. Generalized arteriosclerosis. Amputation of leg 3 weeks previously. T. P. R. normal.	41	56	69
82	37	M	Advanced pulmonary tuberculosis. Sputum +. Died 1 week later.	48	56	62
83	57	M	Carcinoma stomach with metastases.	45.5	59	68
84	31	M	Maxillary sinusitis, toxic symptoms—T. 100.	45	60	66
85	62	M	Carcinoma œsophagus with metastases.	45.5	60	65

[1] T=Temperature; P=Pulse; R=Respiration.

low reading in spite of the anæmia which in itself is a cause for more rapid sedimentation.

In Table III are listed the cases with sedimentation readings ranging between 20 and 40 per cent. A comparison of this group of patients with the preceding ones will explain the higher values. In this group, the temperatures are occasionally found elevated, the operations are more recent and several cases of carcinoma and tuberculosis are included.

In Table IV are listed the cases with markedly accelerated reactions, 40 to 60 per cent in 2 hours. The 19 cases include 7 cases of advanced cancer, 2 of active progressive pulmonary tuberculosis, 3 of postoperative syphilitic complications, several being within the first week after operation. With the exception of Cases 74 and 80, the results are in agreement with the clinical picture of these patients. The high reading on Case 74 may be due in part to the low red count which has been shown to accelerate sedimentation (8). Case 80, of fractured pelvis, gave an unusually high reading.

A study of the composite tables in this paper will reveal that in general the graver lesions are accompanied by more accelerated sedimentation reactions but the exceptions are so frequent that it is evident that the test cannot be based on such a classification. However, the momentary condition of each patient agrees better with the sedimentation reaction than with the temperature or leucocyte count, both of which are frequently within normal limits in the presence of considerable tissue destruction. Increases in the sedimentation reaction followed surgical operations with a return to normal limits in uncomplicated cases in 3 to 4 weeks after operation, or considerably after the temperature had reached normal. Complicated cases necessitating drainage remained high for longer periods and gradually improved with the betterment in the condition of the patient. Those with non-surgical complications such as syphilis and tuberculosis gave higher readings than would be expected from the surgical conditions alone and did not show much change upon the improvement or even upon cure of the surgical affection. This is best illustrated by Table V which shows repeated tests on a group of patients during their hospital stay and after discharge into the out-patient department.

The clinical value of the sedimentation reaction depends upon its frequent repetition during an illness. Single determinations merely indicate the momentary condition and are of no prognostic importance since any change in the patient's condition may alter the results. This view is stressed by all who advocate the test. Considerable emphasis has been placed on the sedimentation reaction as a diagnostic aid in the differentiation between benign and malignant neoplasms and as a criterion of cure of the latter when they are completely removed. Lohr (19) believes the reaction is of diagnostic help in the differential diagnosis between ulcer and cancer of the stomach, sedimentation being more

TABLE V. REPEATED TESTS ON A GROUP OF PATIENTS, DURING THEIR HOSPITAL STAY, AND AFTER DISCHARGE INTO THE OUT-PATIENT DEPARTMENT

No.	Age	Sex	Clinical Diagnosis and Condition	Date	Sedimentation Per Cent. 1 hr.	2 hr.	24 hr.
86	32	M	Chronic osteomyelitis left tibia and pathological fracture of shaft. Removal of sequestrum 6 weeks previously.	11–25–24	4.5	10	38
			Has been working for last month as waiter. Physiotherapy. Wound healed.	4–22–25	5	7.5	28
87	64	M	Chronic suppurative mastoiditis. Old pulmonary tuberculosis. Mastoidectomy 11-13-24.	11–25–24	17	29	53
			5 months after discharge. Deaf left ear. Cold 2 weeks previously, still present.	4–22–25	20	32	52
88	20	M	Right inguinal hernia, strangulated. 11 days after operation.	11–25–24	22	36	57
			Four days before discharge T. P. R.[1] normal.	12–9–24	11	26	56.5
89	37	M	Basal cell carcinoma of face. 4 days before operation.	11–25–24	9	21	39
			2 days after operation (excision) T. 100, P. 100.	12–1–24	22	43.5	67
			12/12 tabularization-skin flap 1/2 completion of skin flap. 2/12 plastic on pedicle.	2–27–25	4.5	11.5	37.5
			One week before discharge. T. P. R. normal. Wounds healed by first intention.	3–18–25	4	8	29
90	53	M	Fracture lower third radius and ulna. 11 days after open reduction.	12–1–24	10	24	52.5
			4 months after discharge. Physiotherapy. Working part time. Gradually improving.	4–22–25	7	19	42
91	52	M	Laceration of urethra (traumatic) 10 days after suturing. T. P. R. normal.	12–9–24	6	18	50
			5 months after discharge. Working 9 hours a day. Returns for dilatations.	4–22–25	5	10	38
92	64	M	Chronic osteomyelitis of femur and tibia. Inguinal hernia. In hospital 9 months. 2 months after amputation of leg in mid-thigh and 1 week after repair of hernia.	12–9–24	37	55	68
			3 months later. Up on crutches, T. P. R. normal. Condition good.	3–18–25	12	21	41
93	29	M	Chronic empyema with sinus. 17 days following resection of 4 ribs.	2–27–25	38.5	50	58
			Still some discharge. Up in chair. T. P. R. normal.	3–18–25	36.5	44	52
			Up and about ward. Condition good. T. P. R. normal.	4–27–25	15	25	44
94	36	M	Tuberculosis of hip. 6 weeks after ankylosis. Bradford frame. Wassermann ++++.	2–28–25	8	19	44
			Still in bed. T. P. R. normal.	3–18–25	14.5	20	44
			Up on crutches. Condition improving.	4–7–25	14	21	41
			Up on crutches. Condition improving.	4–17–25	10	20.5	39
95	28	M	Deep abscess of left thigh. T. 100, P. 90. 13 days after incision and drainage.	3–5–25	35	55	67.5
			Patient still has p. m. fever to 100. P. 100. Wound allowed to close.	3–18–25	40	49	62
96	60	M	Acute appendicitis with abscess. 1 month after appendectomy. Draining.	3–12–25	29	41.5	58
			Up in wheel chair. Improvement. Wound healing well.	4–27–25	10	20.5	45.5
97	52	M	Empyema of gall bladder. 2–19–24 Cholecystectomy and drainage followed by lobar penumonia, resolved by lysis. T. 101. P. 100.	3–12–25	46	62	68
			Bile drainage almost gone. T. 99.5, P. 90. Day of discharge.	3–23–25	35	57.5	66
98	21	M	Pilonidal sinus. 13 days after excision. T. P. R. normal.	3–23–25	5.5	18	40
			18 days after discharge from hospital. Condition good.	4–22–25	4	9	34
99	61	M	Probably cerebral arteriosclerosis.	3–30–25	3	10	30
			20 days after exploratory craniotomy. Condition poor.	4–27–25	25	42	52.5
100	40	M	Tuberculosis of kidney and both apices of lungs. 3 months after nephrectomy.	12–1–24	21	40	65.5
			3 months after discharge. Scar of operation well healed.	4–22–25	20	30	50

[1] T = Temperature; P = Pulse; R = Respiration.

rapid in the latter. His findings were corroborated by Haller (13), Rothe (25) and Hoffgaard (14). In 34 cases of ulcer, Hoffgaard found the sedimentation normal in 8 cases, slightly accelerated in 10, moderately accelerated in 13, and strongly accelerated in 3; while in 53 cases of cancer of the stomach, sedimentation was normal in only 1, slightly accelerated in 4, moderately accelerated in 10, and strongly accelerated in 29. Roffo (24) studied 101 cancer cases and found the rate of sedimentation increased in all except cases of superficial malignant growths in the early, apparently strictly localized phase when the general health had not been affected. Lobhardt (18) believes that early cases of carcinoma are not recognized by this method since the degree of change in the sedimentation reaction does not parallel the spread of the growth but rather its disintegration. Isaac-Krieger and Kalisch (15) found that perforating as well as multiple ulcers of the stomach have as strongly accelerated reactions as carcinomata; and on the other hand, in not a small percentage of small non-ulcerating carcinomata, there was only slight acceleration in the sedimentation reaction. Nitchmann (22) found of 36 cases of malignancy only 3 that did not give increased sedimentation but 2 of these cases were diagnosed early while the third had an ab-

normally high red count (7,000,000). More recently Eick (5) reported a series of 50 cases of cancer of the uterus which were kept under observation for 4 years. He found the sedimentation reaction of little value in diagnosis since inoperable cases also gave normal values but repeated tests were helpful in prognosis and paralleled the clinical findings.

Although our study includes relatively few carcinoma and ulcer cases, our observations are in agreement with those of Lobhardt. From the nature of the reaction, its nonspecificity and its tendency to be more marked with the increased absorption of broken down products, it is not surprising that it fails to be of great help in cases in which confirmatory evidence would be most desirable. Advanced cases are diagnosable without the test although in such instances an accelerated sedimentation reaction might be of some value. Moreover, there are frequent borderline reactions of moderate acceleration and their interpretation would be difficult. Hoffgaard's 13 moderately accelerated reactions with ulcer and 19 with cancer illustrate this. Since the presence of malignant tissue does not necessarily cause an accelerated reaction, it is obvious that the test cannot be depended upon to determine postoperative residue of malignant tissue as advocated by Gueissaz (11), Gragert (10), and Giesecke (9). But we have no proof from our own study to offer.

Friedlaender, Falta, Bronnikoff, Rumpf, Hallberg, and Pewny have found the test of practical value in gynecology and feel that it is of greater value than the temperature or leucocyte count. They are guided by the test in deciding the advisability and time for operation and other gynecological procedure.

In fractures, osteomyelitis, inflammations of various organs and tracts, the observations of Lohr (20) are generally accepted. In diseases of the liver, a delay in the sedimentation reaction has been found of diagnostic value while Joseph and Marcus (16) alone have found the test valuable in the differential diagnosis between acute appendicitis and adnexitis. Within the first 30 hours they obtained no increase in the sedimentation reaction in cases of appendicitis, but an immediate rise in cases of adnexitis.

SUMMARY

1. In surgery, the erythrocyte sedimentation reaction was found to be a more reliable indication of the condition of the patient than the temperature chart.

2. Its diagnostic and prognostic value were secondary to its value in indicating the acuteness of a process.

3. Extrasurgical complications such as syphilis or tuberculosis tended to maintain high readings in spite of the improvement or even cure of the surgical affection. In the absence of such complications, repeated tests may guide in the discharge of patients, although for many reasons it would be impractical to keep patients in the hospital until the reaction had reached normal limits.

4. Because the test indicates the severity of tissue destruction, it should be of value in determining the advisability and time for operation.

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RUPTURE OF THE UTERUS FOLLOWING THE ADMINISTRATION OF PITUITARY EXTRACT

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Pathological Report by Stuart Graves, Louisville, Kentucky

RUPTURE of the uterus following the administration of pituitary extract was brought to our attention by two cases.

In the first case, 1921, the rupture was associated with a transverse presentation and dystocia from contracted pelvis. The patient came under observation some 4 hours after the rupture which occurred during efforts at version. Recovery followed laparotomy with suture of the uterus.

The second case, which is the basis of this contribution, is that of a healthy young wife at the conclusion of her first pregnancy. The history showed considerable difficulty in labor with some inertia, instrumental delivery, and also manual extraction of the placenta. At the conclusion of this latter step marked hæmorrhage occurred and the patient went into serious collapse. She rallied in a short time. During the progress of the labor she received three doses of obstetrical pituitrin with ½ cubic centimeter in each dose, at 2 hour intervals. A slight tear of the perineum was sutured.

Following the delivery the convalescence progressed satisfactorily until the ninth day, at which time she developed some fever, 103 degrees F., with sharp chill. During the next 2 days she showed some improvement. On the twelfth day after labor she again had a chill and fever. There was but little discharge and no odor.

On the thirteenth day I first saw her. The perineal wound looked healthy. There was a small amount of swelling on the right side of the vagina which I took to be thickening about the veins at the pelvic wall. No defect in the vaginal wall was detected at this examination. The uterus was not unduly enlarged and it was not tender. The abdomen was soft, and there was no tenderness or bogginess in the pelvis.

On the fifteenth day she entered Norton Infirmary, temperature 99.4 degrees, pulse 120, respiration 24. At this time, beyond a marked anæmia, she did not look particularly ill.

At my second examination a small opening in the right vaginal wall was observed which admitted the tip of the index finger. Very slight moisture was noted at this point. From the previous thickening and the appearance of this defect in the wall the conclusion seemed justified that this rather than the uterine cavity was the site of the infection.

Blood cultures on two different occasions were negative after 24 and 48 hours. Blood examination showed hæmoglobin 45 per cent; red cells 3,300,000; leucocytes 9,500; no malarial parasites.

She must have had a severe blood loss at the time of labor.

The uterus at this time remained about the same, very little tenderness being present. No pelvic bogginess was observed. The abdomen remained flat, soft, and not tender. In view of these symptoms an expectant plan of treatment was followed.

A chill was recorded on the sixteenth and seventeenth days of her convalescence with temperature 103.6–103.8 degrees. No chill occurred on the eighteenth day, but a very severe one on the nineteenth day with temperature 105.4 degrees.

Notwithstanding the failure to obtain a growth from the blood, 20 cubic centimeters, 1 per cent solution of mercurochrome-220, was given intravenously when the temperature had fallen to 102.6 degrees. A sharp reaction occurred with rise to 105.2. In 12 hours the temperature was normal, but reached 103.8, 24 hours after the injection. The temperature showed a gradual decline, reaching normal 4 days later, the twenty-third day after delivery. On the twenty-fourth day a sharp chill was followed by a rise to 104.8 degrees. After 3 days of apparent improvement the temperature again rose to 105.2, with chilly sensation. After an intermission of 2 days, on the thirtieth day, a severe chill with temperature of 106.2 forced the conclusion that further delay was not permissible.

She had had one intra-uterine irrigation followed by instillation of mercurochrome 2 per cent, and also some vaginal irrigations.

On September 4 operation was performed. Examination under an anæsthetic revealed a circular tear at the ring of Bandl. An exploration of the uterine cavity permitted the passage of a sponge holder, used without any force, through a rent in the fundus, making positive the diagnosis of rupture, which had been considered previously only as a possibility.

When the abdomen was opened the uterus was found to be quite soft and friable, but not much enlarged. Two small tears were observed on its peritoneal surface. After its removal these tears were found to connect in each instance with a somewhat wide separation of the muscular and mucous coats. There was no evidence of any peritonitis about the tears or any other portion of the uterus, which is a rather surprising observation. The torn uterine wall gave positive evidence that the rupture had existed for some time and was not an immediate one.

Pathological report by Dr. Stuart Graves. Gross description: Specimen consists of uterus with oviduct. Uterus 70 by 60 by 25 millimeters. Near the

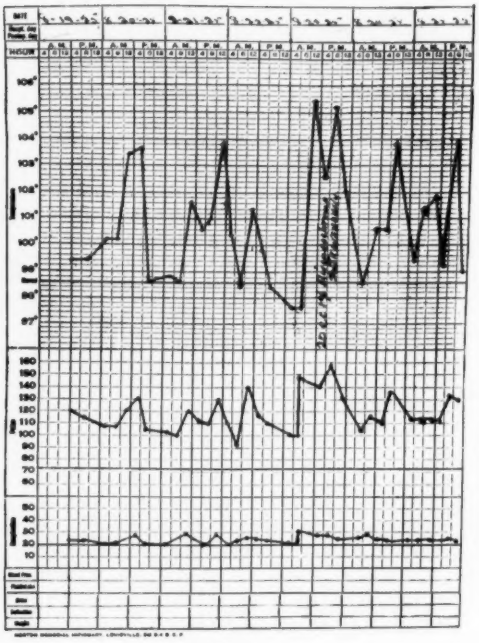

Fig. 1.

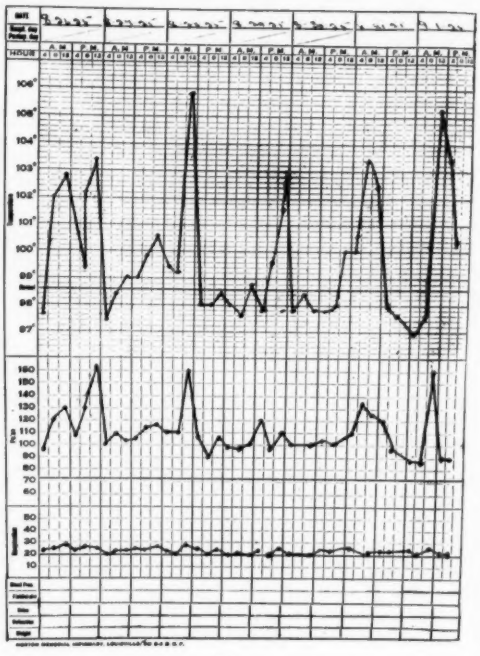

Fig. 2.

Figs. 1 to 5. Temperature, pulse, and

anterior horn are two ragged, linear breaks in mucosa 8 and 12 millimeters in length. These lie side by side about 4 millimeters apart at one end and 10 millimeters apart at opposite end. Sections reveal two ruptures completely through the wall and mucosa, the inner extremities being about 30 millimeters apart. These crevices have sides closely approximated, but mottled creamy gray and dark bluish red, covered with spots of blood and thin fibrinous exudate, and apparently are pre-operative tears. The endometrial surface is spotted with blood clots. The muscularis elsewhere shows similar clefts which dip through the endometrium into the muscularis to varying depths, but no others reach the serosa. The serosa appears a little dull about breaks, but otherwise is not remarkable.

Attached to the uterus is one oviduct 3 by 80 millimeters, soft, injected, and tortuous. The lumen contains a small amount of bloody fluid.

Microscopic description. Uterus: Section through the break in the myometrium shows a cleavage to the peritoneal side which is filled with blood clot and leucocytes. Along the surface of the break red blood cells infiltrate between muscle bundles where there are large numbers of infiltrating leucocytes, including many polymorphonuclear and endothelial leucocytes. In the edges of the ruptured muscle, there is considerable brownish black, granular pigment, much of it taken up by phagocytes. Deeper in the muscle are clumps of leucocytes including polymorphonuclear, endothelial, and many lymphocytes and plasma cells. Through the endometrial wall there seems to be an increased amount of fibrous tissue.

Endometrium: The stroma is densely infiltrated with leucocytes, chiefly lymphocytes and plasma cells. No chorionic villi or decidua are seen.

Oviduct: Moderate round cell infiltration and some blood pigment deposit are present.

Gross and microscopic diagnoses. Complete multiple ruptures of uterine wall. Subacute myometritis. Chronic endometritis. Slight chronic salpingitis.

Discussion. The gross and microscopic appearance of the uterus shows a minimum amount of necrosis along the planes of ruptures, with hæmorrhage and cellular reaction to indicate injury and effort toward repair *in situ*, prior to hysterectomy. It seems evident that the uterine cavity must have been very nearly, if not quite, sterile or a more active reaction about the tears in the serosa would have been evident.

The more interesting features of the case are: (1) the history of profuse bleeding and marked syncope which are important signs of rupture but they had failed to excite the

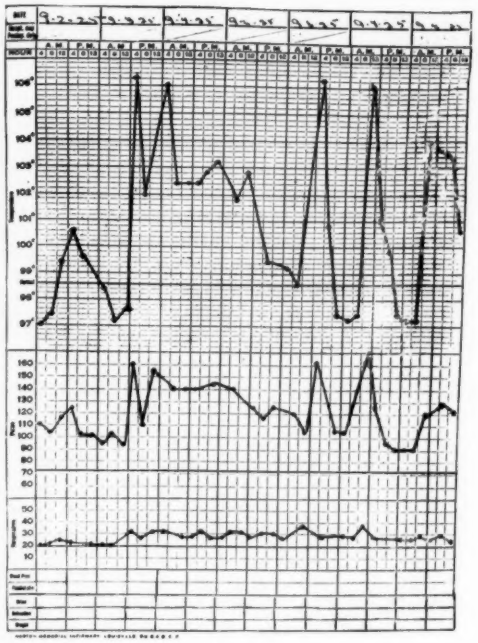

Fig. 3.

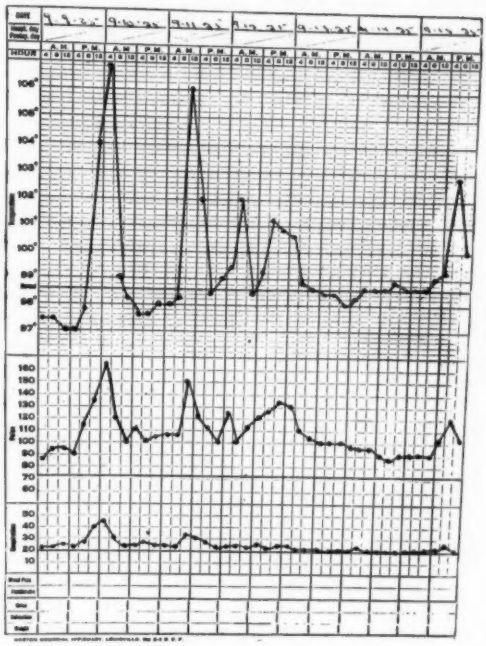

Fig. 4.

respiration charts in author's case.

suspicion of this accident either on the part of the obstetrician at the time or myself subsequently; (2) the absence of peritonitis as a result of the injury, even in the presence of infection sufficient to produce violent systemic reaction; and (3) the failure to obtain a culture of organisms from the blood. The explanation of this failure apparently lies in the fact that when the bacterial flora, evidently of mild type, in the uterine vessels elaborated sufficient toxin, a violent reaction followed its entrance into the blood stream without the actual presence of the bacteria themselves.

The fourth point of importance appears in the recovery of this patient after the long delay during which expectant methods were employed before the radical hysterectomy was performed. The fact that she had received pituitrin during labor must be considered as one at least of the determining causes of rupture. It is perhaps the chief causative factor in this case.

This brings us to a study of the reported cases of rupture of the uterus following the

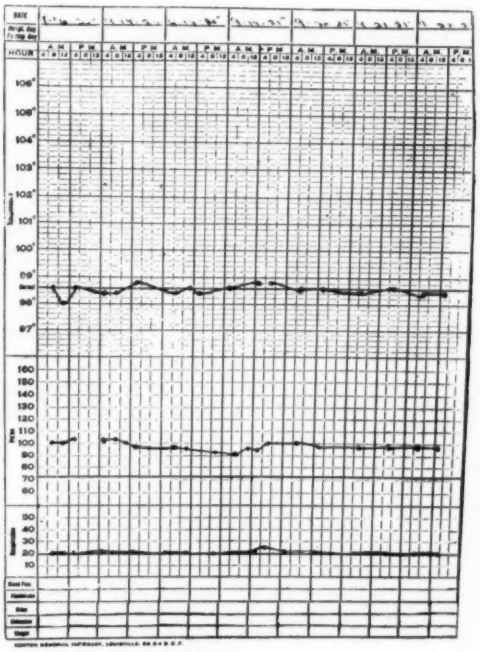

Fig. 5.

Fig. 6. Microscopic section of specimen.

administration of pituitrin, as well as of the question of rupture in general. Some of these cases appear to point to pituitrin as the actual exciting cause of rupture. It would be interesting to learn whether or not the percentage of cases of rupture is greater with the use of pituitrin. The number of cases, however, is too small for us to draw any conclusions upon this point.

A rather interesting study of the "Dangers of Pituitary Extract" has been made by C. C. Haskell and M. Pierce Rucker. Rucker states in another article that by means of a metreurynter with a mercury manometer, he has been able to show the characteristic action of pituitrin upon the uterine muscle. He says: "It never gives contractions with periods of rest between, but always a continuous series of contractions with increase ini ntra-uterine pressure." This is shown by tracings even after the smallest dose. If his conclusions are correct it would appear that the tetanic contractions produced by the drug must be considered as important in the production of rupture in certain cases.

In the case recorded herein it seemed to the writer that the delay in recognition of this rupture was unusual, but in looking over the literature we were able to find a case which was recorded by Dr. Rufus B. Hall, in 1916. In this case the recognition of the accident took place at operation 49 days later. There was no recognition or evidence of any complication or febrile reaction until 5 days after delivery, and rupture was not even suspected. The only evidence pointing to such a lesion was the statement made in Dr. Hall's closing discussion that she lost consciousness for 5 or 10 minutes and her husband, who was a physician, thought she had fainted. Recovery followed Dr. Hall's operation. No record is made of the administration of pituitrin in this case.

In discussing Dr. Hall's case Dr. S. J. Goodman, Columbus, Ohio, records a case which occurred in the service of Dr. Drury, at Grant Hospital, in which diagnosis was not made until a week after the rupture had taken place. He also mentions a second case which occurred in the service of Dr. Baldwin in which the diagnosis was made promptly by the attending physician and came to immediate operation. Both of these cases recovered.

Dr. Palmer Findley at the same meeting,[1] in discussing the papers by Drs. Bell and Ronge on "Rupture of the Uterus Following Cæsarean Section," records a case which he saw in the Charite Hospital in Berlin in the service of Professor Franz, in which rupture occurred after the use of pituitrin.

My attention has been called to a report of two cases of rupture of the uterus, one of which occurred 55 years ago, in 1849, and the other in 1861, both recorded in the *Transactions of the West Virginia State Medical Association*, 1868–1874, p. 619. In the first case the patient died before delivery could be accomplished.

The second patient was a woman aged 23, mother of two children, whose previous labors had been normal. She presented a rupture of the uterus with the escape of a hydrocephalic child into the abdomen at full term of pregnancy. The head was perforated and the

[1]Tr. Am. Ass. Obst. & Gynec., 1916, xxix, 36.

child had been delivered by version 5½ days after rupture. The after-treatment consisted of "cleanliness, brandy, anodynes, and profound rest." The patient was confined to bed and her room for about 4 months after delivery. Menstruation returned the fourth month after delivery.

In 1,130 labors in Dr. Hupp's practice he saw two cases of rupture of the uterus. The latter record comes through a personal communication from Dr. John C. Hupp's son, Dr. Frank LeMoyne Hupp, a distinguished member of this association.

McNeile, L. G., records one case and cites 15 others in the literature in which rupture in the uterus occurred after the administration of pituitary extract, with 13 maternal deaths.

Reported by	Cases	Deaths	Recoveries
Mundell	7	7	0
Herz	1	0	1
Mosher	1	1	0
Huggins	1	1	0
Zullig	5	4	1
McNeile	1	0	1
Total	16	13	3
More recent cases:			
Bourne	1	1	0
Dorland	1	1	0
Maxwell	1	1	0
Phaneuf	2	1	1[1]
Wertenbaker	2	1	1
	7	5	2
Sherrill	1	0	1

[1] In one case no pituitrin was given.

It is not the purpose of this contribution to go into the many causes which result in rupture of the uterus. The use of pituitrin, however, is of considerable importance. Of the cases reported in which rupture has occurred after administration of this drug, the conclusion seems justifiable that its use early in labor may be followed by rupture. Great caution, therefore, should be exercised in its therapeutic employment.

The case here recorded also shows that sudden collapse during the progress or at the completion of labor is of great diagnostic value and should at once suggest its occurrence. Uncontrollable hæmorrhage after the delivery of the child and placenta should cause one to suspect rupture of the uterus, either partial or complete. Inspection of the source of the hæmorrhage shoud clear up the diagnosis.

The mortality in rupture of the uterus, according to Schmauch, ranges from 30 to 63 per cent. These figures compare favorably with the more recent reports of cases following the use of pituitary extract, collected by McNeile, which show a mortality of 85 per cent. The more recent cases, including those of Bourne, Dorland, Maxwell, Phaneuf, Wertenbaker, Hall, Goodman (Drury and Baldwin), and Sherrill, show 12 cases with 5 deaths.

The important causes of death are hæmorrhage, shock, and sepsis. Many of these deaths are undoubtedly the result of ill-advised or protracted efforts at delivery before the condition is recognized. It is evident that prompt recognition and surgical intervention will show marked decrease in the mortality.

The treatment of these cases at operation consists in suture of the torn uterus or in hysterectomy. When there is any doubt regarding the presence of infection, removal of the uterus is preferable. In the absence of infection, suture of the rent as in cæsarean section may be employed. It does not appear in the light of advanced surgical technique that the employment of tamponade would be wise except in those cases in which competent surgical help cannot be obtained.

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EXOPHTHALMIC GOITER IN THE PACIFIC NORTHWEST[1]

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From the Mason Clinic

GOITER is one of the great problems in the state of Washington. It has been estimated that 65 per cent of the boys and 75 per cent of the girls between the ages of 12 and 18 have some enlargement of the thyroid gland. There are districts east of the Cascade Mountains, along the valleys and especially in the region drained by the Methow River, in which all the domestic animals have some disturbance of the thyroid. In this district we find hairless pigs and goats and also weakness in the new-born foals. Until it became a routine practice to administer iodine, the Indians and dogs were the only living things that escaped serious damage. The Indian obtained a considerable amount of iodine from stripped salmon, which is one of his chief foods, and the dog evidently received a certain amount of iodine from the same source.

From these regions especially and from the state as a whole, we see a large percentage of exophthalmic goiter in later life. While there is no proof that adolescent goiter predisposes to exophthalmic goiter, it seems probable that once the internal secretions of the gland have been disturbed, there remains an instability which later in life may cause a toxic, hyperplastic goiter.

Exophthalmic goiter, with few exceptions, runs a typical course, and while the administration of iodine diminishes the toxic symptoms so markedly that they are often rather difficult to recognize, still they are present. There is a gradual increase in the severity of the symptoms until about the eighth month, when the condition becomes markedly worse (Fig. 1). At about the ninth month there is an explosion of symptoms commonly known as the crisis. Then there is a period of improvement with fairly constant symptoms. About the end of the second year, a second crisis occurs which is never quite so severe from the standpoint of toxicity as is the first.

We have for some years endeavored to classify exophthalmic goiter in a workable way. This was attempted so that internist, surgeon, laryngologist, nurse, and everyone concerned with the case might understand about what was to be expected as to severity of illness in each individual. Clinically this classification embraces four stages.

In the first stage we have the patients who are seen very early, after 6 or 8 weeks, when at times diagnosis is difficult, because no specific criteria can be fixed as to when normal function of the gland ended and hyperthyroidism began. This stage is designated as the *early exophthalmic*.

In the second stage we have the patients who came for examination later, 1 to 2 months before the crisis occurs. In them we find pronounced and progressive toxæmia, loss of weight, rapid pulse, and a high basal metabolic rate. This stage is designated as *acute ascending exophthalmic*.

In the third stage we have the patients who have reached the crisis. From the standpoint of toxæmia, the gland is giving off its maximum amount for that particular case. Some of these fully developed cases are not extremely ill; in others the condition is characterized by cardiac decompensation, vomiting, acidosis, prostration, and delirium, and sometimes the patient dies. This syndrome is designated as the *crisis*.

In the fourth stage we have the patients who have been ill for some years. In them we find marked exophthalmos and some bronzing of the skin. The basal metabolic rate is always plus, but it never runs very high. Usually these patients carry on their work with difficulty, no matter how light it may be. Compared with their former state of illness, their present condition is very bad. These we have designated as *late exophthalmic* or *educated gland* cases.

There are two classes of patients with exophthalmic goiter who require a great deal of care and observation. The first class includes young girls who develop the disease and become rapidly worse, so that they may die

[1]Read before the Southern Surgical Society, Louisville, Kentucky, December 17, 1925.

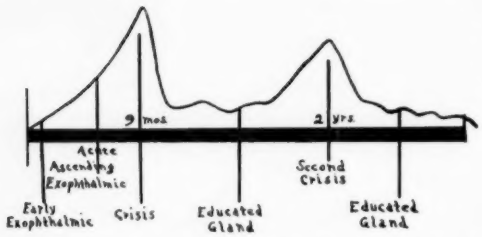

Fig. 1. Usual course of exophthalmic goiter. The black line represents the normal health line.

promptly in an explosion of hyperthyroidism, so violent that not all the classical symptoms may develop, i.e., the patient may have no exophthalmos, relatively little goiter, occasionally little tremor, but very marked prostration, weakness, vomiting, nervous symptoms, and extremely bad pulse. The second class includes patients in the forties or beyond who develop the disease rather suddenly and who do not present appreciable enlargement of the thyroid gland. They may become ill so rapidly that we must assume either a very poor resistance to the disease on the part of the patient or that the toxæmia is extremely grave. Skin pigmentation, sometimes so marked as to suggest Addison's disease, is particularly prone to occur in this group. The goiter is small, and on palpation is hard. In these cases it is often extremely difficult to make a diagnosis. The microscopic picture, however, is typically that of exophthalmic goiter. In each case we have studied we have found very rapid weight loss, tremor and irritability, rapid heart action, marked loss in strength, and no exophthalmos.

In this group are included some very bad risks and each patient has had to be handled with extreme care after the diagnosis was made. The basal metabolic test always showed a high rate in such patients and the medical death rate was high.

With rare exceptions the clinical symptoms subsided so readily following the administration of large doses of iodine that an investigation was undertaken for the purpose of studying any possible change in the pathological picture of the gland after treatment. Examination of a large number of these glands demonstrated that change does occur, as in each case there was noted a large deposit of colloid material which seemed to press the cells against the supporting framework of the acini. As there is no duct through which to discharge the secretions of the gland, the absorption of thyroxin is by the lymph vessels or blood stream.

Plummer (6), Kendall (4), and Boothby (1) believe that there is in exophthalmic goiter a catalytic action of thyroxin and that this causes the syndrome. When iodine is administered, this active principle of thyroxin receives another molecule, which is needed to change it to normal thyroxin.

We have entertained the thought that possibly the outpouring of the colloidal material in the acini following iodine therapy might cause a mechanical obstruction to the lymph and blood supply which would in a way diminish the absorption of this material. In the gland of exophthalmic goiter we find the acini small before the administration of iodine and the cells are large and of the columnar type. In a very short time after the administration of Lugol's solution, we find the acini large and filled with colloid material.

In July, 1925, a patient, whom we considered just on the verge of crisis—a very extreme case of exophthalmic goiter presented himself to the clinic. After a few days' treatment with Lugol's solution he became much better, but was dissatisfied with his surroundings and demanded that something be done without a prolonged stay in the hospital. Feeling that it would be best for the patient, because of his mental attitude, to act, we ligated one pole. At this ligation a small piece of thyroid about one-half centimeter in diameter was removed. Under the microscope this piece presented the picture typical of exophthalmic goiter (Figs. 2 and 3). The patient was then kept in bed for 6 weeks with forced feeding and large doses of Lugol's solution. At the end of that time he had developed an iodine rash. His mental condition was clear, and there was marked diminution of his hyperthyroidism. A partial thyroidectomy was done. The microscope showed large acini filled with colloid material, and instead of columnar epithelium lining the walls, cuboidal epithelium was found and very little hyper-

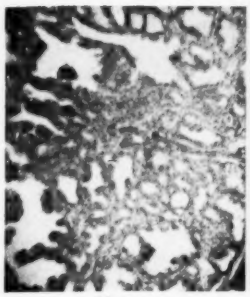

Fig. 2.

Fig. 3.

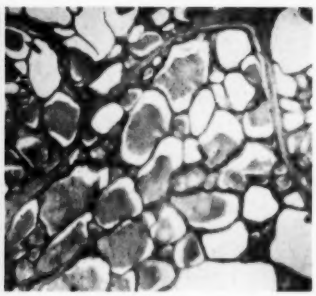

Fig. 4.

Fig. 2. Low power. Exophthalmic goiter, showing hyperplasia and very little colloid. Before iodine therapy.

Fig. 3. High power. Same as Figure 2. Hyperplasia, tall columnar epithelium, pyknotic nuclei, and very little colloid.

Fig. 4. Low power. Colloid goiter. Same gland shown in Figure 2, but after 6 weeks iodine therapy.

plasia (Fig. 4). In other words, microscopically we were looking at a colloid goiter, and not at a hyperplasia, such as had been present in the same gland 6 weeks earlier. This change in the thyroid gland seen after prolonged iodine administration is the same involution described by Cattell (2) and Reinhoff (7).

Knowing the effect produced upon exophthalmic goiter by Lugol's solution, we made a study of the results of administering the drug to dogs with normal thyroids. For this purpose large healthy dogs were secured. Under aseptic precaution, a small piece of thyroid was removed from each dog. To avoid thyroid hypertrophy following partial excision, the blood supply was not disturbed (3). Grossly the glands were normal thyroid glands of a dog. Recovery from operation was uneventful. Administration of Logul's solution, 10 minims twice a day, was begun the following day. The solution was given in capsules for a period of 20 days. Except for slight diarrhœas the dogs were healthy during this time. The second operation was then performed, the entire gland of each dog being removed. Grossly these glands removed at the second operation presented the picture of a colloid goiter. They were friable, glossy, and upon section translucent, with a shiny, brownish red appearance. It seemed as though one could see into the gland substance. On pressure there exuded a thick, viscid, colloid material. Microscopically sections of pieces of glands removed prior to iodine medication were essentially normal thyroids for the dog (Fig. 5). The general picture suggested a slight hyperplasia, as is seen in the exophthalmic goiter. There was only a slight amount of colloid in the gland of one dog.

Study of the glands removed from the dogs after iodine administration revealed characteristic colloid goiter: large acini, some cystic, with single rows of cuboidal epithelium lining them, and all filled with an abundance of colloid material (Fig. 6).

In some further experiments we found that 15 drops of Lugol's solution taken on an empty stomach by a normal individual will show in the saliva in about 11 minutes. In a patient with a hyperfunctioning thyroid we find that the solution comes through in from 18 to 26 minutes. We have not had enough experience with this, however, to make this statement

Fig. 5.

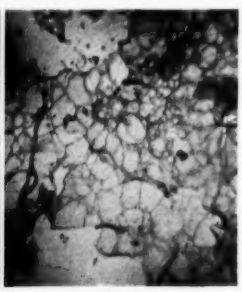

Fig. 6.

Fig. 5. Low power. Normal thyroid of dog. Before iodine therapy. Very little colloid.

Fig. 6. Low power. Same gland as shown in Figure 5. After iodine therapy for 26 days. Marked increase in colloid.

definite at present. From our conception of what iodine means to the hyperplastic goiter, these observations are probably correct. The gland is low in iodine and every cell in the body is in need of it. Marine has shown that the amount of a given intake absorbed depends for the most part on the size of the gland and the existing degree of hyperplasia, or the degree of saturation with iodine at the time of its administration(5).

The test for iodine is a very simple one. A test tube is partly filled with starch paste and one drop of dilute ferric chloride and one drop of dilute hydrochloric acid are added; a small amount of saliva is transferred from the patient's mouth to the test tube and immediately an orange color appears if iodine is present in the saliva.[1]

We feel certain that every patient under treatment should have an overflow of iodine in the saliva, enough to give a decided orange color on testing. Not until then is the patient getting enough iodine.

We have great hopes for the elimination of thyroid disease in the future. A gland with a high iodine content rarely has disturbed function. The water in this Northwest country is low in iodine, and the people are gradually learning this fact. When those in charge of the water supply of municipalities and country districts have realized this deficiency and have acted, not only will exophthalmic goiter gradually disappear, but the other types as well.

[1] Recently we have found a false reaction occurring in the saliva when the starch test is used. This occurs following smoking or the ingestion of certain fresh fruits in patients who have received no preliminary iodine. The reaction is quite similar to that found after the administration of iodine. Calomel may be used as a reagent for the detection of iodine in the saliva. A yellow color is obtained in the presence of iodine when calomel is added to the saliva. The atypical reaction mentioned above, which sometimes occurs with the starch, does not occur with the calomel test.

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CATHETERIZATION OF THE EJACULATORY DUCTS

By HARRY C. ROLNICK, M.D., Chicago

CATHETERIZATION of the ejaculatory ducts is a therapeutic and diagnostic procedure, which, when successfully performed, may be of considerable benefit. Strictures of the ejaculatory duct can be dilated and better drainage of the infected seminal vesicle thus permitted; the closed ejaculatory duct may be restored to patency; the infected seminal vesicle can be medicated and fluid may in some instances be forced into the ampulla of the vas deferens. Under favorable conditions the entire vas deferens and the tail of the epididymis may also be injected; and in this way it may be possible to locate strictures of the vas deferens, determine the patency of the epididymis, and outline the seminal vesicle to determine pathological changes (7).

The danger of epididymitis following the injection of an antiseptic into the seminal vesicles and ampulla is slight. Following vasotomy some of the solution regurgitates into the epididymis; however, an immediate chemical epididymitis is never seen. I have shown recently that no fluid can be forced beyond the tail of the epididymis (4). Any solution injected, if not too irritating, will be rapidly expelled by the peristaltic action of the epididymis and vas without injury to these structures[1]. Epididymitis that frequently follows manipulation of the verumontanum and ejaculatory ducts in catheterization is the result of trauma. Œdema with occlusion of the duct due to trauma prevents drainage of the vesicle, and epididymitis develops.

Despite the fact that the ejaculatory ducts offer a relatively safe and ideal route and direct anatomical approach to the seminal vesicles, catheterization of the ducts and injection of the seminal vesicles is successful in only a limited number of cases. Urologists possessing a fair degree of skill are only occasionally successful in catheterizing the ducts. The difficulties encountered in attempting to catheterize the ducts can be stated.

[1]Rolnick. Experiments not as yet reported.

The openings of the ducts are in most instances so small that they cannot be seen either through the endoscope or cysto-urethroscope. Belfield injected milk through the vas deferens into the vesicle and then stripped the vesicle with the endoscope in place. He was able to locate the ducts by noting the point of exit of expressed contents. Luys has done the same with boric acid solution (3). The mouths of the ducts are found more frequently on the lips of the utricle than on each side on the verumontanum as usually described (5). Therefore it is difficult to insert an instrument even when the ducts are visible. The ducts often open on the inner lip of the utricle. In some cases they may be found on the floor of the utricle with the result that catheterization is practically impossible. Anomalies in location are also frequent. Distortion or atrophy of the verumontanum as the result of a posterior urethritis will usually make it impossible to locate the ducts.

When a catheter or needle has been inserted into the duct it will usually travel but a short distance. The ejaculatory duct is tortuous, runs forward and downward and the catheter cannot often be successfully manipulated to allow for its passage into the seminal vesicle. In most cases in which it is thought that the catheter has entered the vesicle, it will be found, if the cystoscope is advanced toward the bladder, that the catheter has torn through the verumontanum and has entered the bladder.

With considerable practice, in the hands of a few, catheterization of the ducts has been found successful and has been adopted and recommended as the route for direct medication in infections of the seminal vesicles.

Fuller and Luys (3) have shown that a stylet or wire inserted through the ejaculatory duct always enters the seminal vesicle and not the ampulla of the vas deferens. To insert a needle into the ampulla requires considerable manipulation and is always a blind

Fig. 1. Fresh postmortem specimen of the bladder, prostate, posterior urethra, seminal ducts and testicles removed in toto. Contrast fluid consisting of 50 per cent sodium bromide was injected through the ejaculatory duct into the seminal vesicle of each side. The seminal vesicles were over distended with the fluid. Roentgenogram shows the vesicles and also demonstrates that no fluid could be injected into the ampulla of the vas deferens.

Fig. 2. Specimen similar to No. 1, injected in same manner. The seminal vesicles are distended but no fluid could be forced into the ampulla. The dark shadow along the course of the vas deferens near the testicles shows the sheath injected, employed in another series of experiments already reported.

procedure. Any fluid injected into the vesicle is prevented from entering the vas by the tonic closure of the ampulla. When the vesicle is overdistended the fluid will in most instances kick back alongside the needle into the posterior urethra. Belfield (2) was the first to demonstrate on the living a sphincter whose contraction closes the orifices of the ampulla and vesicles. This fact explained why fluids injected through the vas deferens distend the vesicle before escaping through the ejaculatory duct. The ampulla of the vas inserts itself somewhat obliquely into the neck of the seminal vesicle. This insertion is similar to that of the ureter into the bladder. The ampulla and vesicle do not join to form the ejaculatory duct as is generally believed. The ejaculatory duct is continuous with the seminal vesicle but not with the ampulla which enters the seminal vesicle higher up.

The ampulla of the vas deferens remains closed when the seminal vesicle is distended just as does the ureter when the urinary bladder is filled. And, as is true of the ureter, where occasionally reflux will occur following distention of the urinary bladder, reflux will manifest itself up the vas deferens in a few cases when the seminal bladder is overdistended. It is important to remember that in infections of the seminal vesicle the ampulla of the vas deferens is equally involved in the pathological process (1). Any procedure for treating the seminal vesicles must include treatment of the ampulla of the vas deferens. Sterilization of the seminal vesicle alone will not cure the patient.

Young (7), recognizing the necessity for sterilizing the ampulla as well as the vesicle, employs a long needle which is kept near the median line and manipulated into the ampulla. This is a blind procedure and can be successful only occasionally.

It is thus seen that because of the difficulty of injecting the ampulla of the vas deferens, medication of the seminal vesicles by way of the ejaculatory ducts is usually a failure.

The observations from which I have drawn my conclusions were made in living patients and in a series of 29 freshly posted cadavers

Fig. 3. Another postmortem specimen. The sheath of the seminal vesicle and ampulla of one side has been injected showing that contrast fluid has been forced quite a distance along its sheath. This specimen was reported in another series of experiments appearing in the *Journal of Urology*, October, 1925. The seminal vesicle of the other side has been injected through the ejaculatory duct. No fluid could be forced into the ampulla.

Fig. 4. Both vesicles have been injected and overdistended. The ampulla of the vas deferens on one side shows that fluid has entered, the other side could not be injected.

from which the bladder, prostate, posterior urethra, seminal vesicles, seminal ducts, and testicles were removed in toto.

The ejaculatory ducts could not be located with the naked eye in most of the specimens. In order to insert a needle into the duct it was necessary in most cases to strip the vesicles and note the point of exit of the vesicular contents. The openings of the ducts were found to be on the lips of the utricle in the majority of the specimens. In a few they were on the inner lip of the utricle, and in two they were found within, at its base.

When the attempt was made to enter the vesicle by manipulating the needle, the duct was torn through in a few instances and the point of the needle made its exit in the upper part of the verumontanum. A long needle was used and usually inserted into the seminal vesicle. Distention of the vesicles always resulted in the regurgitation of the fluid alongside the needle into the posterior urethra. In only 8 instances was it possible to force fluid into the ampulla of the vas deferens. In all the others, following repeated distention and manipulation of the needle, fluid injected regurgitated alongside the needle without being forced into the ampulla. An attempt to locate the ampulla of the vas deferens with the needle was a blind maneuver and, as stated above, usually unsuccessful.

In these experiments a 50 per cent sodium iodide or bromide solution was injected and roentgenograms were made to determine whether the fluid had passed beyond the seminal vesicle. The illustration showing the epididymis injected was an anomaly which does not figure in the series of cases; in this, the vesicle communicated directly with the vas. However, in only 8 of the 58 injections was it possible to force fluid beyond the vesicle.

These results were had in postmortem specimens in which many of the difficulties encountered in the living are not met.

Fig. 5. The seminal vesicles, ampulla and most of the vas deferens of one side have been injected. This experiment demonstrates the possibility of radiography of the spermatic duct. The other side shows ampulla partly injected.

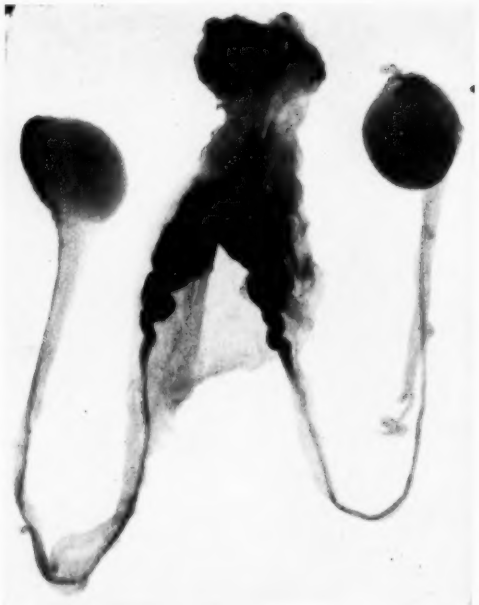

Fig. 6. An anomaly in which the seminal vesicle on each side was rudimentary and communicated directly with the vas deferens. The entire vas deferens and tail of the epididymis is injected. This demonstrates the possibility in isolated cases of radiography of the seminal ducts.

SUMMARY

By injection of the seminal vesicles through the ejaculatory ducts it was possible to force fluid into the vas deferens in only 8 of the 58 injections made in 29 postmortem specimens.

The ejaculatory ducts were so small in most instances that it was impossible to locate them until the seminal vesicle was expressed.

The ampulla of the vas deferens was located through the ejaculatory duct with difficulty in a small number of cases.

CONCLUSIONS

Catheterization of the ejaculatory ducts is a difficult procedure; most attempts fail.

Fluid injected through the ejaculatory duct reaches the seminal vesicle first and not the ampulla of the vas.

The ampulla of the vas deferens does not communicate directly with the ejaculatory duct, it enters the neck of the seminal vesicle.

It is not possible except in a small number of cases to force fluid beyond the seminal vesicle into the ampulla through the ejaculatory duct. Manipulations designed to insert a needle into the vas deferens usually fail and are at best blind maneuvers.

Medication of the seminal vesicles through the ejaculatory ducts seldom accomplishes its purpose, for the ampulla of the vas deferens which is always equally involved in the pathological process can be injected in only a limited number of cases.

I am indebted to Dr. Harry Singer, pathologist of Cook County Hospital and his associate, Dr. Chester Guy for their kindness in furnishing me with the specimens used in these experiments.

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INTRA-ABDOMINAL HÆMORRHAGE OF OVARIAN ORIGIN[1]

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IT is evident from the gradual accumulation of cases of ovarian hæmorrhage recently reported in the literature, that this condition is not so rare as we have hitherto been led to believe; in fact, the frequency of this accident and its gravity warrant the consideration of bleeding from a follicular cyst or from a corpus luteum cyst of the ovary with rupture in making a differential diagnosis. This is particularly true inasmuch as a correct diagnosis is rarely made before operation.

The debatable etiology and uncertain pathology of ovarian hæmorrhage leave this condition still an obscure problem requiring additional study for its explanation. The predisposing factors have been summed up by Stein (8), as follows:

Local

1. Menstrual (excessive menstrual hyperæmia)
2. Non-menstrual
   a. Active hyperæmia, as acute or chronic oöphoritis
   b. Passive hyperæmia, as thrombus, torsion, varix
   c. Primary or secondary neoplasm
   d. Trauma, excessive coitus, etc.

General

1. Diseases altering composition of blood
   a. General disorders of nutrition, as anæmia or chlorosis
   b. Hæmophilia
   c. Infectious diseases, as typhoid, acute exanthemata, etc.
2. Phosphorus poisoning
3. Venous congestion of abdominal viscera, as in heart or lung disease

Phaneuf (5) divides ovarian hæmatomata into three types:

1. The large ovarian cysts with hæmorrhagic contents, due to twisting of the pedicle of the cyst, or other conditions.

2. The perforating hæmorrhagic (chocolate) cysts of the ovary, as described by Sampson.

3. The follicular and corpus luteum cysts of the ovary, which, on rupture, may result in severe intraperitoneal hemorrhage.

The first two groups as a rule give rise to comparatively little intra-abdominal bleeding.

Wolf (9) divides ovarian hæmorrhage into three types: (1) interstitial, (2) follicular, (3) intrafollicular.

Pfannenstiel (4) is of the opinion that these three varieties have no practical difference, one type running into the other; in fact, all three may be present in the same ovary.

Savage (6) groups his cases into hæmatoma of the graafian follicle, and hæmatoma of the corpus luteum, with the microscopical findings as follows:

In the first group, he observed that in places the wall of the hæmatoma was lined with a single layer of epithelium, representing the membrana granulosa lying on a basement membrane, and external to this, two strata of cells, which he regarded as the theca externa and interna. Both strata were vascularized, especially the latter. The cells of the inner layer showed early lutein formation. In the second group, hæmatoma of the corpus luteum, he found that there was an outer shell of ovarian tissue which showed moderate congestion. The inner part of the wall showed newly formed fibrous tissue, poor in cells. Near the lining, in between the longitudinal strands of tissue, there were blood extravasations, many round cells, and many large rounded cuboidal cells, containing coarse yellow granules. The nuclei of these cells were relatively small, and, in many instances, seemed to be crowded toward the periphery of the cell.

Savage is of the opinion that hæmorrhage into the stroma is secondary to hæmorrhage within the follicle, the blood escaping from the latter when the tension ruptures the wall.

On the other hand, Novak (2, 3) believes that the primary source of the bleeding is the perifollicular vascular wreath, from which it

[1]Read before the Williamsburgh Medical Society, Brooklyn, Dec. 14, 1925.

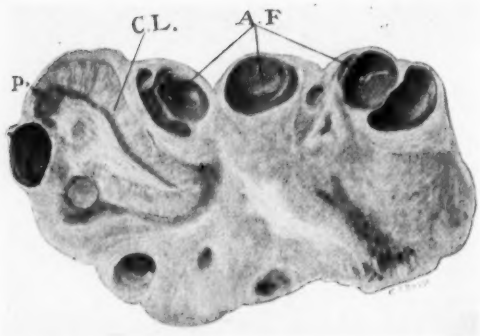

Fig. 1. Cross section of ovary of first case showing *cl*, corpus luteum; with *p*, point of perforation; *af*, atretic follicles.

breaks into the follicle. It is the consensus of opinion that true stromal hæmorrhage is rare.

Bovée (1) makes the statement that no other organ in the body is so frequently the seat of hæmorrhage as is the ovary; and Schumann therefore concludes that there must be a varied and somewhat vague morphological basis on which to account for the bleeding. The latter reports the pathological findings in one of the cases studied by him, as a marked proliferation of the normal perifollicular vessels, with an excessive degenerative arteritis of the vessels.

Schumann (7) likewise sums up the symptomatology and the clinical picture simply as that characteristic of sudden intraperitoneal hæmorrhage, more or less profuse, and usually associated with acute pain in one or the other iliac fossæ. In a few cases, the initial pain is entirely absent, distress being apparent only when the irritating effect of the free blood in the peritoneal cavity produces the characteristic dull generalized abdominal ache. There follows usually some distention, with signs of shock and severe blood loss, or the sthnic reaction of elevation of temperature, moderate leucocytosis, rectus rigidity, and, in general, the syndrome of the acute abdomen. Rectal or vaginal abdominal examination will show an enlarged, tender ovary, or a tender, doughy mass, which is produced by the presence of blood, inflammatory reaction, and adhesions.

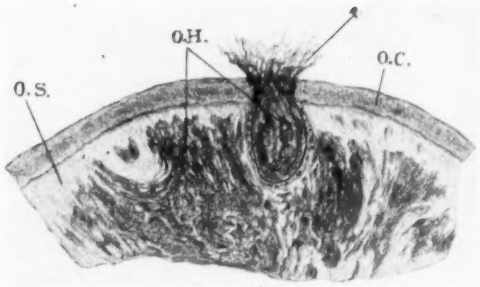

Fig. 3. Gross sketch made from slide of ovary of third case. Hæmatoxylineosin stain, *oc*, ovarian capsule; *os*, ovarian stroma; *oh*, ovarian hæmorrhage; *p*, perforation.

Fig. 2. Microscopical picture of area indicated by X in Figure 1, showing lutein cells to the left side. Blood sinus in center of field.

Fig. 4. Microscopical picture of ovary of third case, showing dense hæmorrhagic infiltration.

Ovarian hæmorrhage may occur at any time from birth until the menopause, but it rarely happens after that unless there is an ovarian growth. The amount of bleeding varies greatly, as indicated in the summary of Novak. He speaks of the small amount of blood lost, namely: two tablespoons, in the cases reported by Armun Mueller and others, while the patients of Buerger and Cohen each lost 2 liters of blood, and in Peuch's case, a loss of 3 pints resulted in a fatal termination.

The following is a typical case of bleeding from a ruptured corpus luteum.

A. P., Italian, age 19, married 2 months, was referred to the Beth Moses Hospital, November 17, 1924, by Dr. Nathan Slutsky, through whose courtesy I was called to see the patient. She had been taken ill quite suddenly with sharp pains in the lower abdomen, 3 days prior to admission, most marked on the right side, not radiating, and lasting 2 hours. The pain then subsided until the day of admission, when she was seized with severe pain across the lower abdomen, vomited a little, and practically collapsed.

The family history was negative. Previous history showed that she had had lung trouble in 1917 and was in a sanitarium for 3½ years. She was discharged as an arrested case. Menstruation began at 14, was of 30-day type and of 5 days' duration; flow was profuse. She had premenstrual dysmenorrhœa and occasionally skipped a period. Previous last regular menstrual period was October 19. She began to bleed on afternoon of admission.

Examination revealed a rather poorly nourished young woman, acutely ill. The lungs showed involvement of the left apex, with many moist crackling râles. The abdomen was rigid and tender over the lower half, with peritoneal rebound. Vaginally, there was an exquisitely sensitive cervix, with a soft, doughy mass in the cul-de-sac. Further examination of adnexa was unsatisfactory, because of extreme tenderness. The temperature was 99 degrees; pulse, 90; red blood cells, 4,100,000; hæmoglobin, 70; white blood cells, 13,000; polynuclears, 80 per cent. With these findings, a diagnosis of ruptured tubal pregnancy was made.

The abdomen was opened by a median incision (Feiner, Slutsky). Upon dividing the peritoneum, there was revealed a massive hæmorrhage, and, on inspection, the right ovary was found to be the source of the bleeding, a small rent in a ripe corpus luteum being apparent on its superior aspect. A tiny blood clot was partially extruded from the point of rupture, while the opening and the cavity to which it led was filled with clots. The right ovary was removed, and the abdomen closed in the usual manner. Convalescence was uneventful, and the patient left the hospital 12 days after operation.

Pathological findings. Gross examination shows that the ovary measures 5 centimeters by 4 centimeters by 3.5 centimeters; on cross section there is revealed a well developed corpus luteum 2 centimeters in diameter and many microcysts. Microscopical examination reveals a corpus luteum in stage of vascularization. Of particular significance as a potent participating factor in the hæmorrhagic tendency of this ovary, is the presence of a large number of blood sinuses immediately adjacent to, and surrounding, the corpus luteum. The walls of these sinuses are made up of a single layer of elonggated endothelial cells accounting for their friability, and are filled with red blood cells. Scattered throughout the ovary are numerous atretic follicles, showing the usual structure of follicle cysts. The ovarian hypertrophy is due to a hyperplasia of the ovarian stroma.

The second case, which I am reporting through the courtesy of Dr. H. Rabinowitz, represents a group occurring in girls of adolescent age during one of their early menstrual periods. Schumann considers that such ovarian hæmorrhages are more or less functional errors; that is, they are the result of an excess of bleeding from the wall of the mature graafian follicle in the adolescent ovary, and there is no demonstrable morphological change present in the tissues.

M. M., age 14, was admitted to Beth Moses Hospital, complaining chiefly of pain in the right lower quadrant. Three hours before admission, patient had an acute onset of cramp-like pains in right iliac region, severe for a half hour, then diminishing, to be present only on pressure, accompanied by nausea and vomiting. Patient has always been well.

Menstruation began at 13, was of 28-day type, (was irregular, coming every 30 to 40 days) of 5 to 6 days' duration. She had to go to bed during last period which came 1 week early, 6 days previous to admission. Examination revealed a robust, well-developed girl, in severe pain. The abdomen was rigid and tender over the right lower quadrant, with some tenderness over the left lower quadrant. No masses were felt. Rectal examination showed a small anteflexed uterus. Nothing definite could be made out in the region of the adnexa, on account of the pain. Pre-operative diagnosis: acute appendicitis. Temperature, 100 degrees; pulse, 90; red blood cells, 3,500,000; hæmoglobin, 65 per cent; white blood cells, 11,000; polymorphonuclears, 72 per cent.

The abdomen was opened by a right rectus incision (Rabinowitz). The bluish shimmer through the peritoneum indicated an intraperitoneal hæmorrhage. The peritoneum was divided and a large quantity of blood escaped. Further exploration

revealed the source of bleeding to be a small rent in a follicular cyst the size of an almond, on the inferior aspect of the left ovary. Here, likewise, the point of perforation, with the cyst cavity, was filled with small clots. The appendix showed no gross pathology. The ovary was resected, the cystic portion being excised; the abdomen was closed in layers. The convalescence was smooth and uneventful. Microscopical examination of the specimen showed the usual structure of an atretic follicle, clinically designated as a follicular cyst; no evidence of endometrial implant.

The following case which I am reporting through the courtesy of Dr. M. R. Robinson, exemplifies that group in which a twisted ovarian cyst may give rise to intraperitoneal bleeding.

J. G., age 23, married 14 months, was referred to Dr. Robinson by her family physician, with a presumptive diagnosis of ruptured tubal pregnancy. Her chief complaint on admission to the Beth Moses Hospital was pain in the left lower quadrant, and some irregularity in her menstrual periods. The family history was negative. Menstruation began at 14 and was irregular. She menstruated at intervals of 1 to 2 years, up to the age of 17; since then, she has varied from 6 to 8 weeks with pre- and co-dysmenorrhœa, one-half day before and the first day of the flow; duration, 6 days; last period, 6 weeks previous to admission. Present history shows that the patient had had occasional mild attacks of pain in the left lower quadrant. The day before admission she was suddenly seized with severe cramp-like pains in the left lower abdomen, which required hypodermic medication for relief. A feeling of soreness over the entire lower abdomen has persisted up to the time of admission. On examination, the abdomen was found to be tender and spastic in the left lower quadrant. Bimanual examination revealed the presence of a tender cystic mass, the size of an orange, in the region of the left adnexa. Red blood cells, 4,100,000; hæmoglobin, 76 per cent; white blood cells, 10,000; polymorphonuclears, 76 per cent. The pre-operative diagnosis was twisted ovarian cyst.

Operation. The abdomen was entered by a median incision (Robinson). The bluish shimmer through the peritoneum suggested an intraperitoneal hæmorrhage, and recalled the first physician's diagnosis of ectopic pregnancy, which now appeared to be confirmed. The peritoneum was incised and a considerable quantity of liquid blood escaped. Further exploration revealed the source of bleeding to be a small rent in a left ovarian cyst, the size of an orange, which had undergone strangulation as a result of two complete twists of the pedicle. The color varied from gray to black, some areas appearing almost gangrenous. The point of rupture, with its ragged edges, presented a blown-out appearance. The left tube was likewise distended, purplish in color, cystic in consistency, and suggested a possible tubal pregnancy. The uterus was small, the right adnexa negative. The left tube and ovary were removed; the abdomen closed in the usual fashion. The patient left the hospital on the fourteenth day after operation, the convalescence being uneventful.

Microscopic examination of a section from the ovary showed a dense hæmorrhagic infiltration throughout, obliterating the ovarian structure. Examination of a section from the tube showed a diffuse hæmorrhagic infiltration with no evidence of chorionic villi or syncytium.

These cases have been reported as a group, not only because of their intrinsic clinical interest, but for the reason that they represent a distinct surgical entity, the possibility of which should be considered whenever we are called upon to unravel the mysteries of an acute abdomen.

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THE END-RESULTS OF MEDICALLY TREATED PEPTIC ULCER

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WHAT are the results of the medical treatment of peptic ulcer? What is the percentage of permanent cure and the percentage of failure? What constitutes a cure and what type of peptic ulcer should be considered amenable to medical management? How should the patient be studied to determine his probable response to treatment?

A search through the current literature on the subject of peptic ulcer does not yield accurate information on these points. There is at the present time a great difference of opinion on the part of those who have published their views. It is quite evident that different writers have formulated their opinions in different ways. In some instances there is lack of sufficiently accurate records to justify conclusions as to end-results.

Friedenwald (3) in 1919, gives the percentage of cure from the use of the Leube diet as 72, from the Lenhartz diet as 66, and from the Sippy diet as 86. Shattuck (5) in 1921, reports the end-results from 28 cases of peptic ulcer observed from 6 months to 2 years. Of these 6 were gastric ulcers, and 22 were ulcers of the duodenum. Twenty-two of the total number of patients remained, during these periods of observation, free from symptoms. Five of the 6 gastric ulcer cases showed a disappearance, under treatment, of the ulcer niche. Eighteen of the 22 duodenal ulcer cases showed various responses. Diamond (1) in 1922, reports a series of 14 cases of gastric ulcer which remained cured for 4 years, a 100 per cent record. His definition of healing consisted of (a) freedom from symptoms, (b) disappearance of the niche, and (c) the passing of peristaltic waves over the former site of the ulcer. No one has reported such results before or since, to my knowledge. Nielsen (4) in 1923, is much less optimistic. He states that in his experience with the medical treatment of ulcer, 60 per cent of patients having symptoms for 6 months or less remained cured. If symptoms had existed from 3 to 5 years, only 20 per cent remained cured, and if symptoms had been of longer duration, very few were healed. Forsyth (2) in 1924, writing on the end-result reports of medically treated ulcer in England from an insurance risk standpoint, speaks of the very great uncertainty of the end-results. Smithies (6) in 1925, claims the cessation of the ulcer process in 361 patients from a total of 470, or 77 per cent. This is a very large series of patients to follow carefully through a number of years, and my own experience would cause me to expect that an intensive study of the progress of these patients would bring about a considerable lowering of the end-result figures.

It is evident that from such recorded statements little but confusion arises. The same variance of experience is found in the literature of previous years. It was with the idea of obtaining more conclusive end-result data for my own guidance that I began five years ago to collect the evidence from the cases tabulated below. Certain requirements for a proper selection of cases were laid down. First, the clinical diagnosis required the presence of an ulcer niche, signs of activity as shown by regional spasm and local tenderness, and a corroborative subjective history. Second, only those cases which on examination appeared to be free from complications were included in the group; that is, cases with ulcer showing evidence of perforation, of obstruction, or showing the suspicion of malignancy, or cases in which an associated inflamed appendix or gall-bladder disease could be determined, were excluded. Third, all patients were placed in hospital under rigid control and were considered under probation for the first 10 days or 2 weeks. All determined foci of infection were removed. Fluoroscopic examinations were made every 5 or 6 days to determine, if possible, whether the passing of local tenderness or spasm and the flattening out of the niche might justify the belief that healing was

under way. The cases which did not show these evidences of healing were excluded from the group. Patients were kept at bed rest in the hospital most of the time for an entire month. They were treated by the Sippy plan of ulcer management, modified in a number of cases because of an intolerance to alkalis or because of some other disturbing factor. Fourth, only patients whose social and economic conditions permitted a careful and long continued course of medical treatment were accepted. They were required to return for re-examination from time to time until the final data were collected in December of last year. Those who refused to return, or could not do so, were excluded from the group. Thus a small series of carefully selected and carefully controlled cases was collected in the ways indicated and the end-results studied. The series contains 35 duodenal, 4 gastric, and 2 secondary ulcer cases, a total of 41 cases. The duration of time, since treatment was concluded, varies from 6 months (1 case) to 5 years. The accompanying tables give briefly the important points of the study.

The important conclusion to be drawn from the study is that, seemingly, a fair percentage of uncomplicated peptic ulcers may be healed by medical methods. It is evident that an ulcer of less than 1 year's duration heals more readily than an older one. Although of the five chronic duodenal ulcers of less than 3 years' duration none has relapsed, yet a visible defect remains in each one. This fact raises a doubt as to whether actual healing has occurred, for the roentgenologist is not able to distinguish a healed ulcer scar with deformity from a flattened inactive ulcer niche. One is compelled imperfectly to judge the state of healing by the absence of spasm, local tenderness, and subjective symptoms. The more acute ulcer has a tendency to heal with a complete disappearance of all deformity. Thus the uninformed roentgenologist has an opportunity to deny the previous existence of an ulcer; greatly to the disquietude of a patient who has painstakinglycarried out a plan of ulcer management for a series of months.

Question as to the certainty of complete healing is fair. It is raised by the fact that of

DUODENAL ULCERS

	Acute		Chronic		Corrected Aug., 1925.	
	No.	Per cent	No.	Per cent	No.	Per cent
Number	9		26			
Healed	8	89	19	73	16	61.5
Defect in healed	4		19			
No defect in healed	4		0			
Not healed	1		7		10	

GASTRIC ULCERS

	Acute	Chronic
Number	3	1
Healed	3	0
Not healed	0	1
Defect in healed	1	0
No defect in healed	2	0

SECONDARY ULCERS

Chronic cases	2
Healed	1
Not healed	1

MEDICALLY TREATED CHRONIC DUODENAL ULCER

Relation of End-Results to Duration of Symptoms

Number of Cases	Duration of Symptoms	Healed	Relapsed
2	1–2 years	2	0
3	2–3 years	3	0
6	3–4 years	5	1
4	4–5 years	2	2
4	5–6 years	3	1
1	7 years	1	0
1	8 years	0	1
2	10 years	1	1
1	12 years	1	0
1	20 years	1	0
1	34 years	0	1

the 19 chronic duodenal ulcers believed to be healed in December, 1924, three have relapsed to date (August, 1925), since the compiling of the original table. Two of these patients (case 1 and case 24) began to have distress, and showed signs of activity of the ulcer roentgenologically, after drinking alcoholic beverages. A third patient (case 16) had a sudden severe hæmorrhage without warning, and roentgenological examination showed evidence of an active ulcer. On the other hand, healing does occur, for when patient 18 recently underwent an operation for cholecystitis, Dr. Epplen, of Spokane, wrote me that the healed scar of a duodenal ulcer was observed.

END-RESULTS OF MEDICALLY TREATED PEPTIC ULCER

Number	Location	Duration of Symptoms	Duration of Treatment	Time since Treatment	Healed Not Healed ⊕ +Defect ○		Relapsed +	Relapsed ○	Result +	Result ○
1029	Duodenum	6 months	1½ years	1½ years	+			○	+	
3880	Duodenum	9 months	6 months	1 year	+			○	+	
4332	Duodenum	2 weeks	4 months	1 year		○	+		+	
1040	Duodenum	3–4 months	6–7 months	3 years		○		○	+	
1697	Duodenum	10 days	15 months	1½ years		○		○	+	
1892	Duodenum	4 months	1 year	1½ years	⊕		+			○
1259	Duodenum	4 months	6 months	3 years	+			○	+	
3469	Duodenum	6 months		2 years	+			○	+	
4919	Duodenum	3 months	6 months	5 years		○		○	+	
3380	Duodenum	3–4 years	4 months	1 year	+			○	+	
3251	Duodenum	20 years	1 month	3½ years	+			○	+	
1425	Duodenum	4 years	1 year	3 years	+			○	+	
661	Duodenum	4½ years	10 days	2 years	⊕		+			○
1147	Duodenum	2 years	2–3 months	2½ years	+			○	+	
1684	Duodenum	10 years	8 months	2 years	+			○	+	
183	Duodenum	2 years	3–4 months	2 years	+			○	+	
3482	Duodenum	5 years	1 year	1 year	+			○	+	
2280	Duodenum	1 year	6 months	3 years	+			○	+	
1661	Duodenum	2 years	1 month	3 years	+			○	+	
3257	Duodenum	4 years	1 month	1½ years	+		+		+	
3256	Duodenum	3 years	1 year	1 year	+			○	+	
1142	Duodenum	3 years	1 year	2 years	⊕		+			○
2526	Duodenum	5 years	1 month	2 years	⊕		+			○
2487	Duodenum	5 years	2 years-irreg.	2 years	+			○	+	
3771	Duodenum	12 years	3 months	1½ years	+			○	+	
3485	Duodenum	1 year	9 months	1 year	+			○	+	
3389	Duodenum	5 years	6 months	1½ years	+			○	+	
2943	Duodenum	4 years	11 months		⊕		+			○
1584	Duodenum	3 years	1 year	2 years	+			○	+	
784	Duodenum	3 years	9 months	2 years	+			○	+	
B1485	Duodenum	34 years	16 months	8 months	⊕		+			○
1424	Duodenum	8 years	1¼ years	1¼ years	⊕		+			○
B1842	Duodenum	10 years	1 year	6 months	⊕		+			○
3576	Duodenum	7 years	2 years-irreg.		+			○	+	
3257	Duodenum	3 years	1 year	1 year	+		+		+	
98	Gastric	6 months	6 months	3 years		○		○	+	
1591	Gastric	13 days	3 years	2 years	+		+		+	
2164	Gastric	10 days	6 months	1 year		○		○	+	
3248	Gastric	3 years	8 months		⊕		+			○
B 549	Secondary	1 year	1 year	2 years	+			○	+	
B 37	Secondary	4 years	1½ years	2 years	⊕		+			○

An analysis of the detailed table in regard to the duration of symptoms and the duration of treatment brings to light several points of interest. Five patients stopped treatment as soon as the month's hospital control was finished. Of these only one has relapsed, an apparent healing of 80 per cent. Patient 11, one of the five who did not continue treatment, has not had a relapse, although she had had ulcer symptoms for 20 years. Because of its irksomeness other patients continued treatment for only 2, 3 or 4 months. Of 10 patients who were under treatment for 4 months or less only 2 relapsed, 20 per cent. Of the 10 patients of the entire series who relapsed 8 were faithful to their treatment for from 6 months to a year and a half. The average time was 13½ months. To be sure, unrecognized complications may have been present which made healing impossible from the beginning, but because patients treated by ambulatory methods do not respond well, and because several patients in this series were not given alkalis at all and their stomachs were not aspirated after the initial examination, one may well believe that bed rest is a most important factor in ulcer treatment, and that the greater part of the

healing, or possibly all of it, occurs during the period of confinement. Possibly it would be more logical to increase the period of bed rest to 2 months and to continue thereafter merely with a bland, finely divided diet, than to shorten the period to 2 weeks or less, and maintain a long program of drugging and aspirating, as is now often done.

RÉSUMÉ

A series of carefully selected and controlled peptic ulcer cases have been studied from the standpoint of their end-results following medical management. Of the acute duodenal ulcers, that is, ulcers of less than 1 year's duration, 89 per cent have been apparently cured after periods of time varying from 1 to 5 years. Sixty-one and five-tenths per cent of the chronic duodenal ulcers have been apparently cured; but a word of doubt is expressed about the ultimate healing of cases in which there remains definite and permanent deformity. Fifty per cent of the acute ulcers and all of the chronic ulcers apparently heal with this deformity. Acute gastric ulcers apparently heal favorably under medical treatment. It is evident that some secondary ulcers heal in like manner.

The suggestion is made that a long period of bed rest may be one of the most important principles, if it is not the most important principle, which is involved in medical ulcer therapy.

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MORPHOLOGICAL CHANGES ASSOCIATED WITH PARTIAL OCCLUSION OF THE PULMONARY VEINS OF ONE LUNG[1]

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THE experiments reported were designed to determine both the immediate and remote clinical and anatomical changes in one lung following partial occlusion of the associated pulmonary veins, with and without section of the phrenic nerve. A chronic stasis is created in the pulmonary circulation similar to that present in many cardiac lesions. Interest in this work has been stimulated by the reports of Tiegel concerning the effect of chronic stasis in the pulmonary circulation on experimental hæmatogenous pulmonary tuberculosis.

METHODS OF EXPERIMENTATION

With intratracheal ether insufflation anæsthesia, the following operation was performed on 13 dogs. Through an incision in the fifth left intercostal space, the chest cavity was opened and the lung retracted. The region of the hilus was exposed and the pulmonary veins, usually three in number, were reduced in caliber to one-third or one-fourth of the original size. The extent of occlusion was regulated by inserting probes of variable sizes through the ligating loop of silk. After partial occlusion of the veins and before the wound was sutured the lung was fully expanded and kept well distended while the chest wall was being closed. In five of the 13 animals, the phrenic nerve was resected for a length of 2 centimeters at the point of passage over the pericardium. The difference in the postoperative course in the two groups of animals was negligible.

EFFECT OF THE OPERATION

In one instance death resulted immediately after the operation, one-half hour after the veins were narrowed to one-fourth of their previous diameter. At necropsy the right ventricle was greatly distended. The 12 other animals were less active during the recovery from ether anæsthesia, and respirations were more frequent and shallow. In 5 of these, when the phrenic nerve was cut, the saliva was mixed with blood for the first 2 days. Forty-eight hours after operation, all 12 animals had overcome the shock of the operation and were generally as active as before, remaining well until the experiment was terminated. A detail constantly observed at autopsy should be mentioned here: To prevent the collapse of the lungs when the chest was opened at autopsy, the trachea was crushed with a clamp and tied with a piece of tape. Although a partial collapse, particularly of the lung not operated upon, proved unavoidable, the factor of collapse remained constant throughout the series.

EXPERIMENTAL FINDINGS

The results of the experiments can be most easily disclosed by type protocols for animals dying from 2 to 3½ days after operation and by studies made at the end of the first and second week and continued up to 1 year after partial occlusion of the pulmonary veins of one lung.

Protocol 1. Medium sized dog. The left pulmonary veins were occluded to one-third of their former diameter and the phrenic nerve sectioned as described above. Increasing dyspnœa was the most marked clinical phenomenon until death in 2 days.

Gross notes. No deformity of the thorax was noted. When the pleural cavities were opened, the right lung which had not been operated upon collapsed somewhat. The left lung with the pulmonary veins partially occluded remained unchanged. No free fluid and no adhesions were found. The pleura was smooth and glistening everywhere. The right side of the heart was moderately dilated. The left lung was bluish-red, firm throughout, and on section yielded hæmorrhagic fluid mixed with a few air bubbles. The lung on the side of operation was larger than the pink one opposite, which was normally crepitant and moist.

Microscopic notes. In the left lung, many alveoli were filled with red blood corpuscles which compressed the alveolar walls; others were greatly congested. The bronchi contained numerous red blood cells and a few leucocytes. In the right lung, the alveoli were either empty or contained a homogeneous pink material. The capillaries in the alveolar walls were distended; the bronchi were empty.

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Briefly, the lung in which the pulmonary veins were partially occluded was large and firm as a result of the great congestion and extensive hæmorrhages into the alveoli, as confirmed by microscopic examination. The opposite lung showed great congestion.

In another dog on which the same operation had been performed and which died with similar symptoms after 3½ days, the findings at autopsy were in general the same except for circumscribed fibrinous adhesions to the wound in the chest wall and to the mediastinum.

Protocol 2. Medium sized dog. The left pulmonary veins were narrowed to one-fourth of their original caliber. Recovery was uneventful. After 24 hours the animal was as active as before operation and it remained well until the experiment was terminated 1 week later.

Gross notes. No deformity of the chest was noted. The diaphragm stood at its usual level on both sides. The left lung was adherent to the chest wall by fibrinous adhesions, which partly obliterated the pleural cavity. There was a moderate herniation toward the side of operation of the upper and lower part of the anterior mediastinum, where it is thinnest. The right lung collapsed somewhat. The lung with the narrowed veins remained distended and both lungs were of the same size (Fig. 1). The right heart was not markedly dilated. The left lung was bluish-red and firm, and on section yielded only a few air bubbles. The right lung was normally crepitant and moist.

Microscopic notes. In the left lung, most alveoli contained desquamated alveolar lining cells and some leucocytes mixed with red blood corpuscles. Phagocytosis was frequently encountered. The alveolar walls contained dilated capillaries (Fig. 2). The bronchi were either empty or contained cellular débris and some leucocytes. In the right lung, the alveoli were empty or contained pink material. The alveolar walls contained dilated capillaries (Fig. 3). The bronchi were empty.

To recapitulate, at the end of the first week there were extensive pleural adhesions of the lung with the pulmonary veins partially occluded. The opposite lung not operated upon pushed the anterior mediastinum in its thinnest places to the side of operation, but at autopsy this control lung collapsed somewhat so that both lungs were the same size. The lung with the veins narrowed to one-fourth was firm and showed microscopically hæmorrhages mixed with an inflammatory exudate filling the alveoli; phagocytosis within the alveoli was quite conspicuous.

Protocol 3. Large dog. The left pulmonary veins were reduced to one-fourth of their original caliber. Recovery was uneventful and complete after 24 hours. The experiment was terminated after 2 weeks.

Gross notes. No chest deformity was noticed. The lung with the pulmonary veins partially occluded was adherent to the chest wall along the scar of operation and to the mediastinum. Dilated blood vessels passed from the lung surface through these adhesions to the intercostal veins and into the mediastinum where they joined the internal mammary vein. The herniations in the anterior mediastinum extended to the side of operation for a distance of 3 centimeters. The lungs corresponded in appearance to the description in Protocol 2.

Microscopic notes. In the left lung in which the veins were partially occluded, the alveoli were empty and the capillaries in the alveolar walls dilated and tortuous with a slight increase of the perivascular tissue. The medium sized blood vessels showed a thickening of the wall as compared with analogous blood vessels of the opposite control lung. In the right lung, the alveoli were distended and the capillaries in the alveolar walls dilated.

Summary. At the end of 2 weeks, pleural adhesions were found at the site of the chest incision in the lung with the pulmonary veins partially occluded. These adhesions led to the formation of venous collaterals from the surface of the lung into tributaries of the superior vena cava.

The herniation of the mediastinum resulting from the expansion of the lung not operated upon was conspicuous. The firmness of the lung in which the veins were reduced to one-fourth of the original caliber was increased, due to a general congestion. In some areas an incipient fibrosis was visible in the perivascular tissue of the capillaries and medium sized blood vessels.

Protocol 4. Large dog. The left pulmonary veins were occluded to one-fourth of the original caliber. Uneventful recovery followed and the animal remained well until the experiment was terminated 1 month after the operation.

Gross notes. No deformity of the chest was found. The lung with veins reduced to one-fourth normal caliber showed adhesions along the scar of operation on the anterior chest wall with venous collaterals passing through them. The bronchial veins were greatly enlarged on this side and the number of branches was increased. The displacement of the anterior mediastinum, already mentioned in previous protocols, remained the same. The lung with the veins partially occluded was dark blue and firm, and one-fifth smaller than the opposite control lung which was crepitant and moist.

Microscopic notes. In the left lung, areas of empty alveoli with thin walls and congested blood vessels alternated with areas in which the empty alveoli were outlined by thickened walls due to a connective tissue increase around the blood vessels (Fig. 4). The bronchi were empty. The right lung, the untouched lung, showed uniformly dilated capillaries in the alveolar walls with absence of any connective tissue growth (Fig. 5).

In this case of 1 month's duration, the herniation in the anterior mediastinum seemed to have become stabilized. Pleural adhesions to the scar of operation gave rise to venous collaterals. The bronchial veins also were greatly distended and emerged with numerous enlarged branches from the hilus of the lung the pulmonary veins of which were partially oc-

cluded. This lung was somewhat smaller and firmer than the opposite lung. The fibrous tissue along the walls of the dilated capillaries in the alveolar septa was particularly conspicuous in the vicinity of the bronchi and larger blood vessels. The process was irregularly distributed throughout the section. The alveoli were empty. On cross section the thickening of the medium sized blood vessels was evident. The changes in the lung with the veins partially occluded were practically the same after 2 months as after 1 month. The opposite control lung pushed the mediastinum at its thinnest places to the side operated on. The mediastinal lobe of the right lung expanded below the heart toward the lower portion of the lung with the occluded pulmonary veins (Figs. 6 and 7). Adhesions along the mediastinum were found. The lung in which the veins were reduced in caliber was smaller and firm in consistency. On section it yielded blood-stained fluid and a few air bubbles. The opposite control lung was crepitant and moist. Microscopically the connective tissue increase within the alveolar walls in the lung with the pulmonary veins reduced to one-fourth was quite conspicuous, but irregularly distributed throughout the field (Fig. 8). The changes were most advanced in the vicinity of the bronchi and larger blood vessels. Dilatation of all the blood vessels in the right lung was the only finding of note.

Protocol 5. Medium sized dog. The left pulmonary veins were reduced to one-third and the phrenic nerve sectioned. Recovery was uneventful and the animal remained well. The experiment was terminated at the end of 3 months.

Gross notes. No deformity of the thorax or spine was noted. The paralyzed diaphragm was one intercostal space higher than the intact one. The displacement of the mediastinum was the same as that mentioned previously. Pleural adhesions to the scar of operation and to the mediastinum were found. The bronchial veins emerged with enlarged tortuous branches from the hilus of the lung with the pulmonary veins partially occluded. Their caliber was three times as large as that of the bronchial veins of the lung not operated upon. The lung with the pulmonary veins partially occluded was firm and somewhat smaller, and yielded on section only a few air bubbles, whereas the opposite lung was normally crepitant and moist.

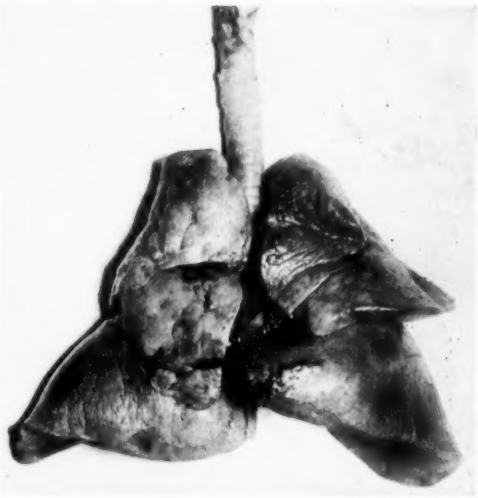

Fig. 1. Lungs 7 days after partial occlusion of the left pulmonary veins.

Microscopic notes. In the left lung, the alveoli were empty but narrowed by the thickened alveolar walls due to distention of the capillaries and the

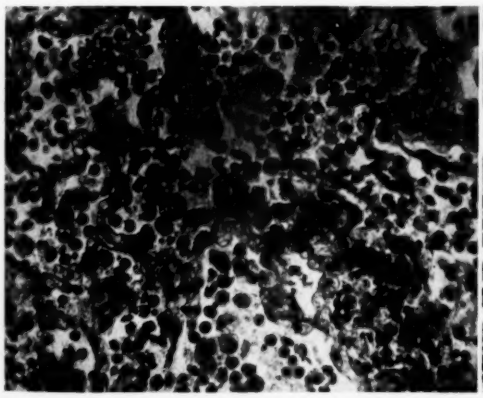

Fig. 2. Photomicrograph of lung 7 days after partial occlusion of pulmonary veins. Red blood cells, desquamated alveolar lining cells, and leucocytes fill alveoli. The blood vessels in the alveolar walls are congested (375 ×).

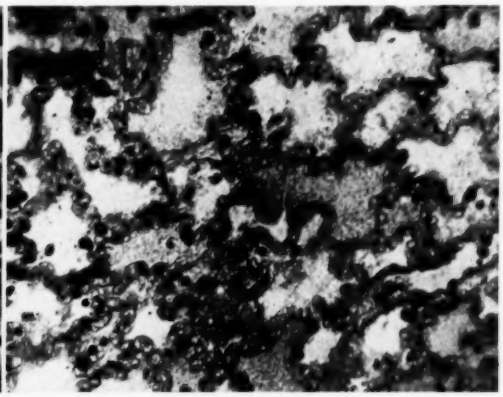

Fig. 3. Photomicrograph of the opposite lung which has not been subjected to operation. Empty alveoli and dilated capillaries in the alveolar walls are noted in this section (375 ×).

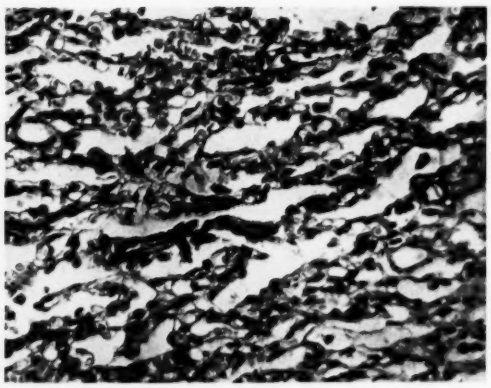

Fig. 4. Photomicrograph of the lung 1 month after partial occlusion of the pulmonary veins. There is some increase in connective tissue in the alveolar walls (375 ×).

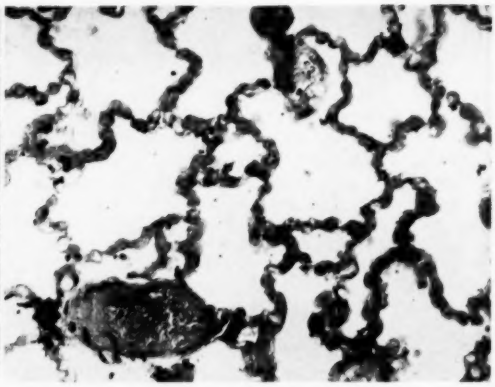

Fig. 5. Photomicrograph of the lung not subjected to operation 1 month after partial occlusion of the pulmonary veins of the opposite lung (375 ×).

connective tissue growth around the blood vessels. The process was not uniform throughout the sections. In the right lung, empty alveoli and alveolar walls with dilated capillaries were the only findings of note.

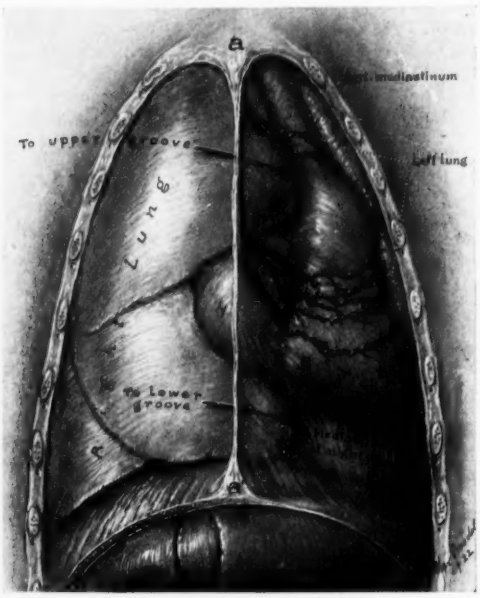

Fig. 6. Anterior view of the chest organs in a dog 85 days after partial occlusion of the left pulmonary veins. The expanding lung not operated upon pushes the mediastinum toward the lung whose pulmonary veins are partially occluded thus forming herniations in the mediastinum where it is thinnest (upper and lower groove). New venous collaterals arising from the surface of the lung with partially occluded pulmonary veins empty into the internal mammary vein.

After 3 months the gross findings were almost the same as those observed after 2 months, with slight variations in the four specimens from experiments of almost the same duration (85, 85, 90, 95 days). Pleural adhesions of the lung with the pulmonary veins partially occluded were found at the usual location, namely, the scar of operation and the mediastinum near the hilus. In two instances distended branches of the internal mammary vein with radicles arising from the surface of the lung in which pulmonary veins were narrowed passed through the anterior mediastinum by way of mediastinal adhesions. In three observations, the bronchial veins were greatly dilated as they emerged from the hilus. Branches communicating with the œsophageal veins and with the pericardiophrenic veins were also dilated (Fig. 9). In comparing the caliber of the two pulmonary arteries, the right side was noticeably larger. The lung in which the veins were reduced in caliber was firm and somewhat smaller.

Microscopically, the process of fibrosis had progressed very slowly. Variations in specimens from experiments of the same duration were noticed. Dilatation of all the capillaries with absence of any connective tissue proliferation within the alveolar walls was a constant finding in the lung which had not been subjected to operation.

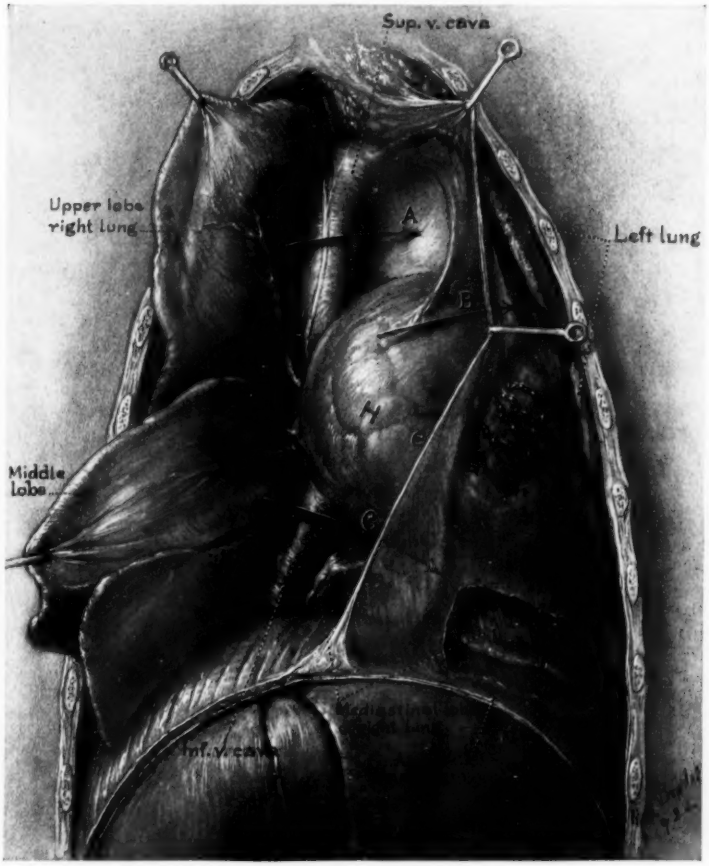

Fig. 7. Same as Figure 6. The right mediastinal lobe expands posteriorly to the inferior vena cava toward the left lateral chest wall.

In a specimen from an experiment of 4 months' duration, the gross changes were essentially the same. No deformity of the thorax was noted. The pleural adhesions were restricted to the usual places. The displacement of the thinnest portions of the mediastinum to the side of operation was distinct. The bronchial veins on the side with partial occlusion of the pulmonary veins were 3 times the caliber of those on the opposite side. The pulmonary artery on the side of operation was larger than on the opposite side. The lung in which the veins were reduced in size was smaller and felt firm. Microscopically, the connective tissue proliferation within the aveolar walls was conspicuous. It also involved the sheath of the medium sized blood vessels. On gross and microscopic examination, the lung not operated upon always showed the same picture as that mentioned.

Protocol 6. Medium sized dog. The left pulmonary veins were occluded to one-fourth of their original size For 2 days the respiration was accelerated and deep. The animal remained well. The experiment was terminated after 1 year.

Gross notes. No deformity of the thorax or spine was noted. There was a marked displacement of the mediastinum in its thinnest portions to the side

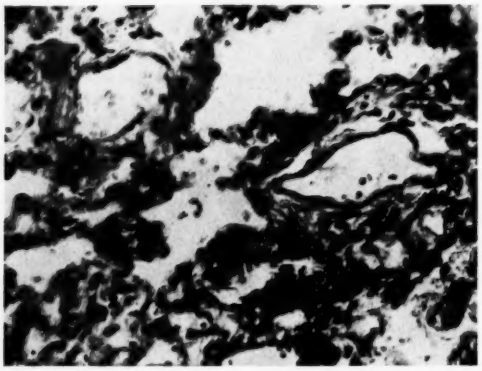

Fig. 8. Photomicrograph of the lung with reduced pulmonary veins 2 months after operation. The increase of connective tissue in the alveolar walls is quite conspicuous (375 ×).

of operation. Below the heart, the enlarged mediastinal lobe of the right lung pushed the mediastinum toward the side of operation. The lung with constricted veins showed fibrous adhesions to the mediastinum, to the adjacent portion of the diaphragm, and around the scar of operation. New collateral veins were noted arising from the lung surface and going through these pleural adhesions into intercostal veins. The left mammary vein was much larger than the right. Other newly formed veins passed from the medial surface of the lung through the mediastinum into the superior vena cava. Branches taking their origin from the lower lobe of the lung entered the diaphragm. Along the phrenic nerve, enlarged vessels reached the first intercostal vein. On the side of operation, the bronchial veins were greatly distended in their whole course and in their communications with the œsophageal veins and the pericardiophrenic veins. The right pulmonary artery was larger than the left. A hypertrophy of the wall of the right ventricle was noted and confirmed microscopically by the greater size of the muscle fibers, as compared with those in the left side. The lung with the pulmonary veins reduced in caliber was one-fifth smaller than the opposite lung (Fig. 10) and felt firm when compared with the crepitant right lung. On section only a few air bubbles were obtained from the lung with the constricted veins. The opposite lung was moist.

Microscopic notes. In the left lung, the alveoli were empty. A connective tissue proliferation was associated with irregular thickening of the alveolar walls and was more advanced in areas situated near the larger blood vessels and the vicinity of bronchi (Fig. 11). On cross section, the walls of the blood vessels showed a definite thickening, visible even in the main branches of the pulmonary artery. Throughout the section of the right lung, the alveoli were large and empty and the capillaries in the alveolar walls were distended (Fig. 12).

Summing up, at the end of 1 year there was no thoracic deformity, but there was displacement of the mediastinum at anatomically weak places. The pleural adhesions on the anterior and mediastinal side gave rise to the formation of venous collaterals draining into the superior vena cava. Also, the bronchial veins were greatly distended in their whole course and their branches communicated with the œsophageal and the pericardiophrenic veins. The main pulmonary artery of the lung with the constricted veins was decidedly smaller than the corresponding vessel of the opposite lung. A hypertrophy of the right ventricle was demonstrable. The lung with the veins partly occluded was one-fifth smaller than the opposite side, was firm, and on section yielded few air bubbles.

Microscopically, the left lung, with the veins reduced in caliber, showed empty alveoli narrowed by irregularly thickened alveolar walls due to connective tissue growth, particularly around the small and medium sized blood vessels, but even demonstrated in the large vessels. In the lung not operated upon, the alveoli were empty; the alveolar walls were thin and contained dilated capillaries.

COMMENT

In the dog, great congestion with hæmorrhages into the alveoli was the immediate effect after partial occlusion of the pulmonary veins of one lung. Grossly, the organ became large and firm. The opposite lung, which was not subjected to operation, became distended and pushed the mediastinum at its anatomically weakest places to the side of operation. The herniation was not very conspicuous in the upper mediastinum where a moderate bulge, found during the first month and later, was the maximum change. Below the heart, where the mediastinal lobe of the right lung expanded toward the side of operation, the hernia was easily visible. After 1 month the process was fairly well stabilized.

Pleural adhesions on the side of ligation were restricted to the places of trauma during operation, to the wound in the anterior chest wall, and to the mediastinum near the hilus. The amount of adhesion varied in different observations. In one instance they were quite extensive. Where the pleura was free, it remained thin and glistening. These pleural adhesions formed the path for new venous collaterals arising from the surface of the lung with the constricted veins, and running into different tributaries of the superior vena

Fig. 9. From the hilus of the lung with the pulmonary veins partially occluded the bronchial veins emerge as large tortuous vessels.

cava. This method of overcoming the congestion resulting from the partial occlusion of the pulmonary veins was present in 5 experiments (15, 85, 95, 130, 355 days). Where these pleural adhesions were not considerable and the collaterals just described therefore were not well established, another mode of venous outlet occurred. The bronchial veins and their communications with the œsophageal veins and with the pericardiophrenic vein became greatly enlarged. This was present in six instances (30, 85, 90, 95, 130, 355 days). In two instances (85 and 355 days) both forms of collaterals were demonstrated at necropsy. In a previous publication, the clinical importance of this repair process in a greatly congested lung was discussed fully.

Size comparison of the two lungs at necropsy was not entirely satisfactory inasmuch as at necropsy the crepitant lung which had not been operated upon collapsed somewhat, whereas the lung with the veins reduced in caliber was firm and remained unchanged in

Fig. 10. Lungs 1 year after partial occlusion of the left pulmonary veins.

size. Preliminary tight closure of the trachea before opening the chest proved ineffective in preventing partial collapse of the lung not operated upon. In experiments of a few days' duration, the lung with the constricted veins was somewhat larger than the opposite lung. Specimens from experiments of 2 weeks' duration showed the size of the two lungs to be about equal; after 1 and 2 months and up to 1 year, the lung with the occluded veins had become somewhat smaller and its consistency markedly denser.

From the end of the third month, and always thereafter, the caliber of the pulmonary artery of the side not operated upon was larger than the artery of the side of operation. Associated hypertrophy of the wall of the right ventricle became more and more conspicuous as demonstrated on microscopic examination of a specimen from an experiment of 1 year's duration. Dilatation of the right ventricle was not very marked even after 1 year.

On section, the lung with the constricted veins yielded hæmorrhagic fluid. Frothy fluid was obtained from the opposite lung in all specimens.

Microscopically, the lung with the pulmonary veins partially occluded showed great congestion and areas of hæmorrhages, in the first week. The hæmorrhages were more extensive when the phrenic nerve had been cut. At the end of the first week, desquamated alveolar lining cells and leucocytes were mixed with red blood cells. The blood vessels were greatly dilated throughout the section. Later the alveoli gradually emptied and by the third week, some contained a few phagocytic cells only. A proliferation of connective tissue along the capillaries within the alveolar walls was conspicuous and increased very slowly in the following weeks and months. On cross section, the medium sized blood vessels showed a definite thickening of the wall which was gradually augmented in the course of months and developed parallel with analogous changes around the capillaries. This process of fibrosis was irregularly distributed throughout the organ. After 2 or 3 months, small strands of connective tissue connected bronchi and larger blood vessels and surrounded zones where the proliferation was less advanced. After a year, the fibrosis of the lung with the reduced veins was well marked in the perivascular tissue, around the capillaries in the alveolar walls, and around the medium sized branches of the pulmonary artery.

The opposite lung showed microscopically the same picture throughout the whole series: empty large alveoli and dilated capillaries in the alveolar walls without any evidences of connective tissue proliferation.

The congestion in the lung with the obstructed vessels is combated in two ways: venous collaterals with veins of the chest wall (internal mammary; intercostal) are formed through pleural adhesions; or pre-existing veins, such as the bronchial, dilate. This dilatation also involves the vessels communicating with the œsophageal veins and with the pericardiophrenic vein.

In the lung not operated upon dilatation of all the blood vessels occurs. This general dilatation diminishes the peripheral resistance and facilitates the blood flow through this lung. It gradually causes a retrograde dilatation of the small blood vessels and finally of the main branch of the pulmonary artery in the lung not operated upon, as demonstrated

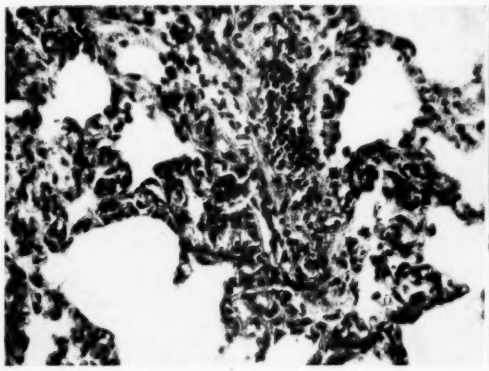

Fig. 11. Photomicrograph of the lung the pulmonary veins of which were reduced to one-fourth the original size 1 year previously. Note the marked increase in fibrous tissue in the alveolar walls and around the medium sized blood vessels (375 ×).

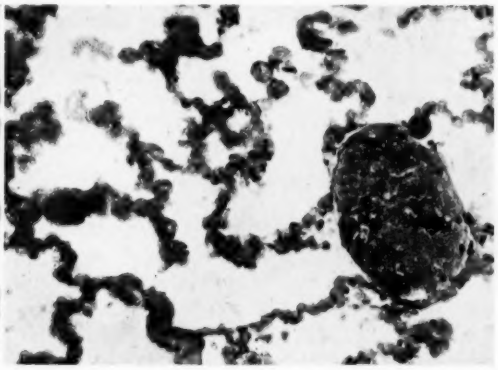

Fig. 12. Photomicrograph of the lung not operated upon 1 year after partial occlusion of the pulmonary veins of the opposite lung. There is no increase in connective tissue visible (375 ×).

in the specimen taken from a dog in which the experiment was of 1 year's duration.

General dilatation of all the capillaries in the alveolar walls of the lung not operated upon may be one factor which causes dilatation of this lung. Von Basch illustrated this mechanism by forcing water through a rubber tube fixed in a slightly oblique coil about a rubber bag; the force of the fluid in the tube determines the extent of expansion of the bag.

Clinical observations concerning diminished susceptibility to tuberculosis of persons with left-sided heart lesion may be explained on the basis of pulmonary congestion with subsequent fibrosis as noted by Rokitansky, Fraentzel, and Eichhorst (Johanne) and demonstrated in the experiments reported in this communication. In 1911 Tiegel confirmed this assumption by experiments. With silver wire, he partially occluded the pulmonary veins of one lung in rabbits and dogs. One month later he injected a suspension of tubercle bacilli intravenously and sacrificed the animals after 2 to 3 months. The lung with partially occluded pulmonary veins was decidedly less affected; the tuberculous lesions were small, well defined, with no tendency to caseation, but with distinct evidence of proliferation and healing by fibrosis. The nearer the occlusion reached total obstruction the less frequent and smaller were the tuberculous lesions encountered in this lung.

SUMMARY

Partial occlusion of the pulmonary veins of one lung immediately causes a great stasis in this lung and hæmorrhages into the alveoli. Hæmorrhages are more extensive when the phrenic nerve is sectioned.

Dogs may die during or shortly after the reduction of the size of the pulmonary veins, or from 1 to 2 days after the operation with increasing dyspnœa, congestion, hæmorrhages into the lung with the obstructed veins, and dilatation of the right ventricle. If the animals survive the acute effect of the operation, complete recovery occurs within 48 hours and they remain quite well throughout the experimental periods.

Displacement of the mediastinum toward the side of operation at its thinnest places results from a dilatation of the lung not operated upon. The lung with the veins reduced in size is compressed. When the chest is opened at necropsy, an inevitable partial collapse of the lung not operated on makes it impossible satisfactorily to demonstrate this change after death.

Pleural adhesions are noted at the places of greatest trauma during the operation, in the line of incision on the anterior chest wall, and in the mediastinum near the hilus.

These pleural adhesions form the pathway for the establishment of new venous outlets from the congested lung into tributaries of the

superior vena cava. Another way of diminishing this congestion is the dilatation of pre-existing vessels such as the bronchial veins and their communication with other veins. The clinical importance of these collaterals has been discussed fully in a previous publication.

In the lung not operated upon, the dilatation of the blood vessels, noted in the alveolar capillaries immediately after the partial occlusion of the pulmonary veins of the opposite lung, gradually distends the medium sized and larger blood vessels. After 1 year the circumference of the pulmonary artery of the side not subjected to operation is larger than that of the other side.

Microscopically, in the lung with the pulmonary veins partially occluded, the hæmorrhages in the alveoli disappear but the congestion remains. A proliferation along the capillaries in the alveolar walls is noted in the third week. It increases very slowly and ultimately causes a thickening of the alveolar walls. Around the larger blood vessels, also, a connective tissue growth is noted. The resulting fibrosis is irregularly distributed throughout the lung.

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ACTINOMYCOSIS BOVIS OF THE LEG

By G. MILTON LINTHICUM, M.D., F.A.C.S., Baltimore

THE assumed belief among the profession that actinomycosis is a rare disease leads me to report a case. I say assumed because a thorough investigation of the subject has shown a number of unreported cases. The difficulty in making a diagnosis in my case prompts me to believe that many discharging actinomycotic sinuses and ulcerations are unrecognized. I do not wish to suggest that actinomycosis is of frequent occurrence, but I do believe that there is a sufficient number to warrant, in questionable cases, very careful investigation by repeated microscopical examination of sections taken from several locations in the diseased area and by repeated search for the "granules" in the pus.

The last complete compilation of cases was made by Sanford of the Mayo Clinic in 1923. This report included 678 cases and followed a report of only 119 cases which was made by Sanford and Magath 2 years previously. The great increase in number in the second report was due to two things: a more thorough investigation and search for cases, and the inclusion of all cases due to a fungus, cases which were formerly classified as nocardia, streptothrix, or pseudo-tuberculosis, etc. Sanford was warranted in including such cases, as he used the nomenclature of the American Society of Bacteriologists. Before this the classification of J. Homer Wright had been the recognized one. Wright's classification limited the term actinomycosis to infections caused by the actinomyces bovis which forms "sulphur granules" with club-shaped rays, which is not acid fast, is very difficult to grow in culture and ordinarily anaerobic, and which differs diametrically in the three last characteristics. There is no unanimity in the nomenclature of these fungi, and doubtless in time the limitation of Wright will be re-established.

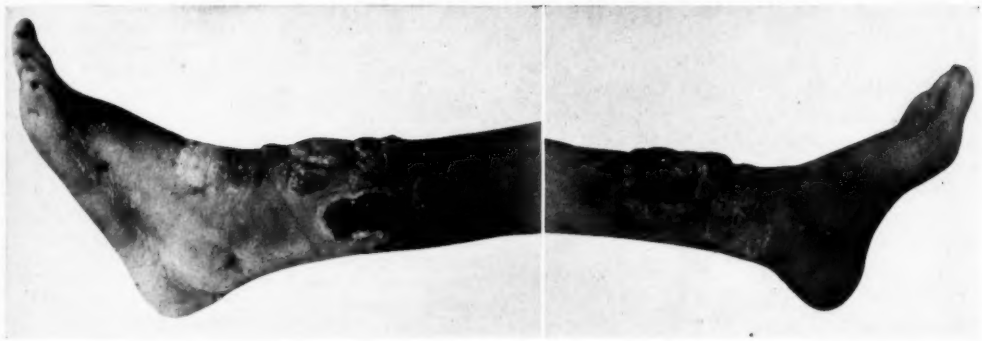

Fig. 1. Photographs of patient's leg, showing lesions.

Sanford conducted a most intensive search to discover cases. He found 209 cases in the United States definitely reported in the literature. Through health officers he located 87 unpublished cases; through letters sent to hospitals and medical schools, 148 cases were added; letters published in the *Journal of the American Medical Association* and the various state medical and dental publications brought 99 cases to him; 135 cases were reported at Mayo Clinic—a grand total of 469 unpublished cases were found. Since the publication of Sanford's report in 1923, 6 cases have been published and with the one I am citing, the total number of known cases in the United States is 685.

It is an interesting fact that actinomycosis in cattle was long considered a form of sarcoma of the jaw. Bollinger, however, in 1877 definitely proved that it was a vegetable parasitic infection, caused by a micro-organism to which Harz gave the name of actinomyces bovis, because of the radiate colonies of vegetable growths found in the tissues. Shortly after this J. Israel reported a case in man. He described the organism but did not recognize the fact that the micro-organism he found was identical with that described by Bollinger. The identification of the bovine and human infections was first made by Ponfik in 1879. The first case in the American literature was reported by John B. Murphy in 1885.

Sanford's conclusion as to the geographical distribution is that the disease is widespread, but he intimated that its apparent frequency in the Atlantic Coast States was due probably to the particular attention which had been given to the search for cases.

The usual impression is that the disease is the result of direct animal contact, but we find that about one-half of the reported cases did not come in contact with animals at all.

Cases were in either an acute or chronic stage. The infection occurred usually in early life, although patients in later life have suffered from the disease. One patient was 28 days old and two were men aged 82 years.

The most common sites of infection in order of frequency are the head and neck, the abdomen and thorax, but rarely the limbs.

The infecting agent as described by Wright is a small, pale yellowish, irregular granule varying in size from a fraction of a millimeter to 1 to 2 millimeters—the so-called "sulphur bodies." The larger sized body is usually an aggregation of granules which gives it a mulberry-like contour. The essential element of the granule is a branching filamentous micro-organism which is seen in varying degrees of degeneration and transformation. Over and around the granule is the radiate formation of hyaline club-shaped bodies of different size and thickness, but with the definite radial arrangement which is the characteristic feature for diagnosis. How perfect this arrangement is depends upon the development or stage of degeneration.

The manner of infection is still a debated question, but careful investigation is being carried on to determine this factor. The gen-

eral and common belief that it is due to direct infection from animals is not apparently borne out by investigation. This was especially true in the group of 107 cases of head and neck infections reported by Figi and New in 1923. As yet it has not been definitely determined whether or not the actinomyces is a normal inhabitant of the mouth and intestine and that the infection occurs through an injury of the mucosa and again whether the organism is not present on hay, wheat, barley, or other vegetations, and that infection occurs as a result of injury and direct inoculation from this source, such as from swallowing a barley head or from chewing wheat or timothy straw or from picking the teeth with them. The case I report would seem to be due to direct infection in an injury from contact with vegetation.

The diagnosis of the disease is based upon the clinical history, especially its chronicity, and the confirmation of the diagnosis is dependent upon the finding of the "sulphur granules" and ray fungus.

Case No. 16,048. April 1, 1925. Patient was a white man, married, age 63 years, a farmer. The family history is negative except that one sister died of cancer of the neck. Patient has had the usual diseases of childhood, with malaria at age of 16. Nine years ago the skin over the shin bone was denuded by a wagon wheel. This lesion healed in about 1 month. It recurred 4 years later and was "cured" by a salve in about a month or two. One year ago a sore returned in the seat of the old one, since which time it has not yielded to treatment but has rapidly increased in size and depth. Patient continued to work until about 6 weeks ago when he had to give up because the leg became heavy and swollen. He has no pain and feels generally well. No history of contact with lumpy jaw animals could be obtained.

Physical examination shows a poorly nourished, almost emaciated, man not acutely ill, with no pain. His only complaint is the swollen foot and ankle, with a suppurating growth in the lower third of the left leg. The head and neck are negative on examination. The left pupil is irregular with opacity in the upper third of the cornea due to an early injury. The tongue is dry, dirty, and furred. The upper teeth are missing with the exception of a few remaining decayed roots. A few carious "snags" are present in the lower jaw. Marked pyorrhœa is present. The thyroid is normal in size. The cervical glands are palpable, but not exaggerated. The chest is normal on percussion and auscultation. The heart shows no hypertrophy and heart sounds are distant, feeble, indistinct, with extra systole and no murmur. The pulse is of small volume, weak, irregular, and intermittent. There is a moderate sclerosis of the peripheral vessels. Blood pressure is 100–70. The abdomen and genito-urinary system is negative. The epitrochlear, inguinal, and femoral glands are all palpable with no difference in size of the right and left inguinal. A general chronic adenitis is present.

Examination of the blood showed Wassermann, negative; urea, 32.4 milligrams per 100 cubic centimeters; leucocytes, 13,100; small lymphocytes, 29 per cent; large mononuclears, 2 per cent; polymorphonuclears, 69 per cent.

X-ray examination of the left leg showed thickened periosteum along the lower third of both tibia and fibula. There were denser shadows in the soft tissues which may have been due to some metallic substance in the dressings. X-ray examination of the chest and abdomen showed calcified masses at the roots of both lungs with no evidence of gross pathology in the lung fields to indicate a recent infection from tuberculosis or actinomycosis. Examination of the abdominal cavity was negative. There were marked arthritic deposits on the bodies of the lumbar vertebræ.

Temperature on admission to the hospital was 101.4 degrees and he ran a septic temperature until the leg was amputated, when it became practically normal.

Smears made from the pus from the ulcer showed many pus cells, numerous cocci, no actinomyces or granules. Anaerobic cultures showed no actinomyces. Guinea pigs injected with pus from the ulcer died at the end of 3 weeks. Sections of the inguinal and lymph glands showed no actinomyces.

On admission to the hospital patient showed considerable disturbance in mentality. His answers to queries were slow and rather indeterminate and it was only by marked persistence that my assistant, Dr. Carter, obtained a history which was supplemented and confirmed by relatives. On the tenth day he had delusions of being attacked by a negro with a knife. Fæces and urine were voided involuntarily. He had no conception of time and talked irrationally. He was unclean in his habits and had no desire for food and had to be fed. This condition continued until the leg was amputated. No improvement was noted until a few days before he left the hospital, when he showed signs of improvement with orientation returning, and he expressed a desire to go home.

The left foot and leg to within 3 inches of the knee were markedly œdematous, boggy, and brawny. On the anterior surface of the lower third of the leg was a large, 5 inch, fungoid, multilocular growth extending around two-thirds of the circumference of the leg. The edges of the sinus were elevated above and overlapped the uninvolved skin. Circumferentially, the growth was papillary, multiform, and lobulated in character; centrally the area was ulcerated and discharged a dirty pus. The

growth was very vascular and bled freely on manipulation. It was insensitive (¼ inch) to touch, manipulation, or incision. Several sections were removed, without pain, for examination. The general appearance of the growth was strongly suggestive of an epithelioma or a sarcoma but could be differentiated from epithelioma because of its spongiform architecture, absence of extensive deep destruction, and lack of inguinal gland involvement and from sarcoma because the ulceration was well defined.

The diagnosis lay between malignancy, syphilis, and one of the streptothrix or fungus lesions. As the first sections sent to the laboratories of the Maryland General Hospital and University of Maryland College of Physicians and Surgeons did not show granules or mycelia, a negative diagnosis was made. They reported that the growth was not sarcoma, epithelioma, or syphilis but that it was some unusual tumor. Dr. Bloodgood also examined a section, and his report was negative. He found some areas suggestive of xanthoma and some cells of the sarcoma type, but melanin was absent. A second specimen was sent to Dr. Bloodgood on which he reported: "Sections show skin and an ulcerated area. In the subepidermal tissue there is a diffuse infiltration of polymorphonuclear cells, plasma cells, and all sorts of wandering cells. In places there are accumulations of polymorphonuclear cells forming pus."

It was in this pus that we found the sulphur granules of actinomycosis. Slides made by Dr. Bloodgood were examined and the diagnosis confirmed by Dr. Spencer of the University of Maryland and by Dr. White of the Maryland General Hospital.

On the early assumption that I was dealing with a case of actinomycosis I first treated the patient with large doses of potassium iodide. As I noted no improvement I determined to amputate his leg, which I did May 1, 1925. He recovered well from his operation and left the hospital July 10, 1925. October 1, 1925, his condition was reported to me by a representative of an artificial limb company, who had visited him to outfit him with a leg. He is well and managing his farm.

CONCLUSIONS

Actinomycosis bovis is not a disease of frequent occurrence nor is it so rare as not to be considered as a strong possibility in chronic suppurating conditions.

The site of the lesion is unusual. This fact taken in conjunction with its onset, tends to confirm the source of infection as ex corpore, that is the habitat of the organism is not within the body but is on some form of vegetation which has come in contact with the body.

In our case the fact that the man did not come in contact with infected cattle would suggest that direct animal infection did not occur.

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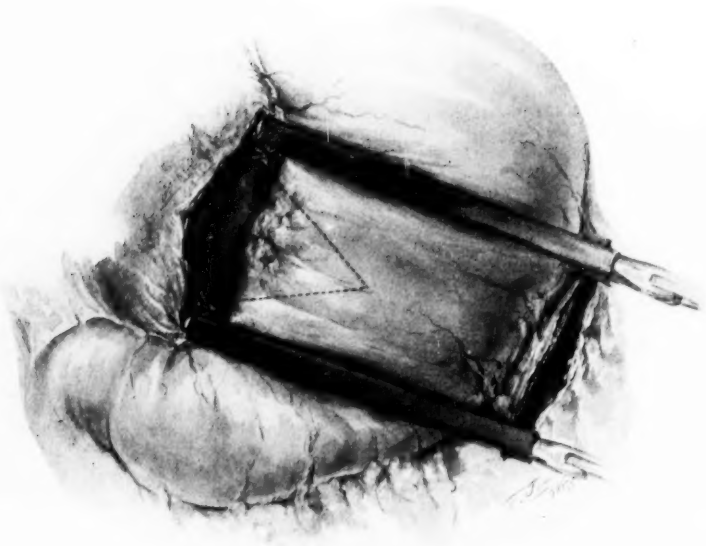

Fig. 1. Clamps in position and incision outlined.

Operation for Gastric Ulcers of the Lesser Curve.— A. J. Walton.

CLINICAL SURGERY

FROM THE SURGICAL CLINIC OF THE LONDON HOSPITAL

OPERATION FOR GASTRIC ULCERS OF THE LESSER CURVE

By A. J. WALTON, M.S., F.R.C.S., B.Sc., London, England

WHENEVER possible the operation selected for gastric ulcers of the lesser curve is a wide excision followed by temporary occlusion of the pylorus and a posterior gastro-enterostomy. If, however, there is narrowing at the site of the ulcer leading to advanced constriction of the hourglass type, or if the symptoms show the slightest suggestion of the onset of carcinoma, the operation preferred is a partial gastrectomy by the modified Pólya method. In very large ulcers which are situated high up and which are firmly adherent to the pancreas, a simple gastro-enterostomy is performed as a temporary measure, and a year or so later a second operation is performed. By this time the ulcer may have so decreased in size that excision is relatively easy.

DANGERS AND POSSIBLE COMPLICATIONS TO BE FEARED

With careful investigation by modern methods, including the test meal and X-ray, there are few if any complications which should not be realized beforehand, and provided against. A gastric ulcer on the lesser curve is frequently associated with a second ulcer at the pylorus or duodenum, and not infrequently with gall stones or chronic appendicitis. The conditions which may give rise to the greatest difficulty at operation are the presence of firm adhesions to the pancreas and the onset of carcinoma. A careful investigation of the symptoms, of the test meal and X-ray, will in nearly every case give a warning, if not a positive proof, of one or other of these complications. The dangers of the operation itself are relatively slight. Unquestionably the greatest danger today in upper abdominal operations is the onset of lung conditions due to the use of deep anæsthesia, and the difficulties of arranging for adequate surroundings during the recovery period at a large hospital. It is hence found that private operations have a much lower incidence of bronchopneumonia and pneumonia than is found with hospital patients. If care be taken in the operative treatment there should never be any possibility of postoperative hæmorrhage or leakage. The risk of mechanical obstruction at the site of the gastro-enterostomy is today reduced to a minimum, and is only likely to occur if the mesocolon is scarred and thickened, and the colon itself bound down. In such cases the difficulty can generally be overcome by making the anastomosis anterior-retrocolic, or even anterior around the colon. Acute postoperative dilatation of the stomach is a very rare complication, and can usually be successfully treated. The danger of recurrence of ulceration at the site of excision, which is very great when simple excision alone is practiced, is almost wholly eliminated by combining the treatment of the ulcer with posterior gastro-enterostomy.

PREPARATION OF THE PATIENT

It is essential that every patient who is to have any upper abdominal operation has a period of rest in bed before this is performed, and nothing is to be more greatly deprecated than the custom which is sometimes carried out of admitting a patient to the home or hospital the evening before operation. Hospital patients are usually admitted 4 days before operation, during which period a careful history is taken and the X-ray and test meal investigations are carried out. With private patients such investigations are usually performed before admission to the nursing home. They are, however, admitted and kept in bed at least 36 hours before operation. Provided there has been no excessive pain nor any hæmorrhage, they are allowed such diet as they can conveniently take, without increasing their symptoms, up to midday. In the evening only a little Benger's food or milk diet is given. At about 5 a.m. on the morning of the operation, which is performed at 9 a.m., 3 to 4 ounces of meat broth is administered, and a hypodermic injection of $^1/_{100}$ grain of atropine given at 8:15 a.m. The previous habit of strongly purging the patient is

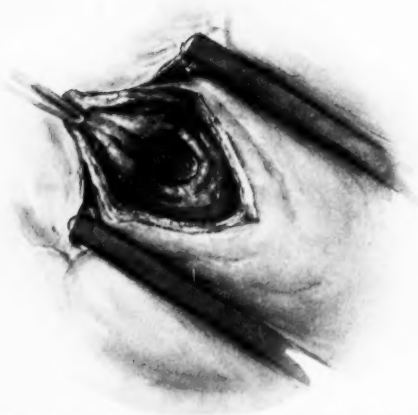

Fig. 2. The anterior wedge of lesser curve is excised first so that the limits of the ulcer can be seen.

Fig. 3. Excision of ulcer-bearing area completed.

now abandoned. Provided the bowels have been regularly opened, no drug at all may be required, but if necessary a small dose of aperient may be given on the evening of admission. The choice of such aperient is usually left to the patients so that they will take only a drug to which they are accustomed. If the result obtained by its use is not very satisfactory, an enema is administered on the evening previous to the operation.

On the same evening the pubes, and, if necessary, the whole of the abdominal wall are shaved. The whole abdomen from just below the nipple line to the pubes is painted with iodine and wrapped in a sterile towel. In hospital patients when the skin is less clean it may be necessary before this is carried out to cleanse the surface thoroughly with soap and water, special attention being given to the umbilicus. Early on the morning of the operation a second coat of iodine is applied, and a third while the patient is on the table. For 48 hours previous to the operation all smoking is prohibited.

TECHNICAL STEPS OF THE OPERATION

Anæsthesia is as a rule induced with open ether, and is continued either with ether on an open mask or with warmed ether vapor. Prolonged gas and oxygen anæsthesia is used only in exceptional cases, and local anæsthesia only in patients who are severely ill, such as in cases of perforation or severe hæmorrhage.

The last coat of iodine having been applied, and the towels clipped in position, an incision is made about 6 inches in length. It lies 1 inch to the right of the midline and starts above, just over the costal margin, and passes down to the level of the umbilicus. As soon as the skin and subcutaneous tissues are divided, two large gauze pads are clamped to either side of the incision with curved forceps, and clipped together above and below the wound. Hence the surface of the skin is entirely excluded from the operation. The anterior sheath of the rectus is divided in the line of the skin incision and the inner flap of aponeurosis reflected inward until the inner edge of the rectus is reached. This muscle is retracted outward and the posterior sheath divided in the same line as the anterior sheath. In patients with a very poor abdominal wall, or in whom the posterior sheath is very thin, a transverse incision in the line of its fibers is made 4 to 5 inches long instead of the vertical incision. This pararectal incision is now used practically as a routine for all operations upon the stomach, gall bladder, duodenum, and pancreas.

A hand is inserted into the peritoneal cavity, and the appendix—and in females the uterus and ovaries—rapidly examined. If these are found to be normal the gall bladder and pancreas are investigated, and also the duodenum. Any complication is much less likely to be overlooked if it is searched for before the attention is fixed upon the lesion which is known to be present.

The stomach is then drawn out of the wound and the lesser curve examined. The ulcer is usually evident on account of the localized thick-

Fig. 4. The peritoneal surfaces of the posterior wall of stomach are sutured with running suture of catgut.

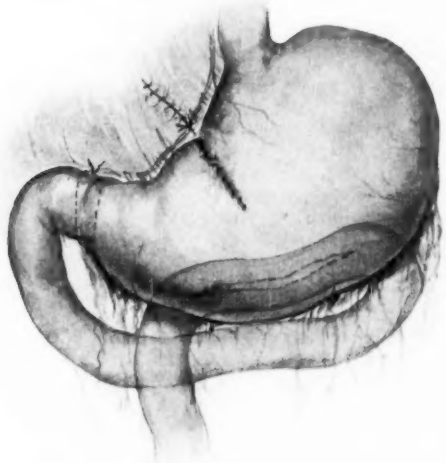

Fig. 5. Wound sutured, pylorus embedded with running mattress suture, and gastro-enterostomy indicated.

ening of the lesser curve, the induration of the lesser omentum, speckling and scarring on the surface of the stomach and the presence of a pit into which the finger can be inserted by invaginating the anterior wall of the stomach. Should the ulcer not be found on the lesser curve or anterior surface, an opening is made through an avascular area of the gastrocolic omentum, and the posterior surface of the stomach explored. In this way a posterior ulcer will not be overlooked. During this investigation a search is made for the presence of any peritoneal nodules or hard glands such as might indicate the presence of early carcinoma. An opening is now made in the lesser omentum above the ulcer, and the coronary artery ligatured both above and below the ulcer. One blade of a clamp is passed through the opening in the gastrocolic omentum and out through the opening in the lesser omentum. It is clamped well above the ulcer. A second clamp is placed in a similar manner below the ulcer.

Should the ulcer be adherent to the pancreas it is freed from the surface of this structure by careful dissection. If it is deeply penetrating, this procedure will open up the cavity of the stomach, but since the clamps have been applied on either side of the ulcer but little leakage will take place, and the escaping fluid can be mopped up at once. A gauze pad is now passed beneath the stomach and between the two clamps, and the ulcer with a wide area of surrounding stomach excised in a wedge-shaped form. The wedge of the anterior wall of the stomach is usually made first, so that the limits of the ulcer can be clearly appreciated. When the excision of the posterior wall is completed, the whole of the ulcer and a surrounding margin of healthy tissue is completely removed.

Forceps are applied at the apex of the V-shaped opening posteriorly, and by lifting this up the peritoneal surfaces of the posterior wall of the stomach are easily seen and are sutured together with a running suture of catgut which terminates and is tied at the lesser curve. A second suture is passed through all thicknesses of the posterior wall, and this also is tied at the site of the lesser curve. The opening in the anterior wall is sutured in a similar manner, the first row of sutures passing through all three layers of the stomach, and the second through the serous and muscular coats only. When the latter suture reaches the lesser curve it is tied not only to the first suture which passed through the seromuscular coat but is made to pick up the divided edges of the gastrohepatic omentum, so that when it is tied these are approximated and the line of suture of the stomach is covered along the lesser curve. The clamps are now removed, and should there have been a raw area left on the surface of the pancreas this is embedded with a few catgut sutures through the opening in the gastrocolic omentum. The stomach is now pulled over to the patient's left, and the pylorus

embedded with a running mattress suture of silk so as to bring about a temporary occlusion

X-ray investigation in the Follow-up Department has shown that this temporary occlusion does not persist for more than 2 months, after which the pylorus opens again.

A posterior no-loop gastro-enterostomy is now performed, a portion of the jejunum being brought up through the mesocolon and anastomosed in the ordinary manner with the stomach. The opening into the stomach is placed differently from that of an ordinary gastro-enterostomy. It is made to run transversely as close as possible to the greater curvature and is so placed that one half is proximal and the other half distal to the sutured line of excision. By this means neutralization of the acid content is carried out high up in the stomach, and should any hourglass constriction follow the excision of the ulcer—a complication which I have never known to occur —both pouches of the stomach would be drained by the gastro-enterostomy. The anastomosis is performed in the usual way, all the sutures being of catgut and consisting of two layers, the first passing through the seromuscular coats and the second through all three layers. The opening of the mesocolon is now sutured to the posterior wall of the stomach close to the anastomosis in the usual way, and the viscera replaced.

The abdominal wall is closed with a series of sutures, all of which are of catgut. The first passes through the peritoneum and posterior sheath, a running mattress suture being used which is passed from within on the right side and from without on the left side. By this means the two layers are made to overlap, the right half lying superficially to the left. Not only does this give a firmer grip of the structures so that the suture is less likely to cut out during the process, but by giving two surfaces in apposition, it is thought that a firmer union occurs. Since its adoption 9 or 10 years ago no case of incisional hernia has occurred in the author's practice. The rectus is stitched into place with a single catgut suture, and the anterior sheath united by a simple running catgut suture, the skin being united by silkworm-gut sutures. In very stout patients a few tension sutures which pass through the skin, anterior sheath, and muscle may be used, but they are not inserted as a routine practice. A simple gauze dressing is then applied.

POSTOPERATIVE CARE

The patient after being returned to bed is allowed to lie upon one or the other side. As soon as he begins to come round he is given a hypodermic injection of ¼ grain morphine and $^1/_{100}$ grain atropine, and for the first 24 hours small sips of water are allowed by mouth. As soon as he is well round he is propped up, and the convalescence in the first 2 days is carried out in the sitting posture. For the first 24 hours morphine is given as often as may be necessary to keep the patient comfortable, for it is not thought that the use of this drug gives rise to any complications but greatly helps the postoperative comfort of the patient. For the first 24 hours the room is kept very warm and the windows closed, for there is no doubt that by such a method the danger of postoperative lung complications is much diminished, and it is in this respect that the ventilation which is necessary for a general ward is found so unsatisfactory in the postoperative stage. While the patient is sitting propped up, it is generally necessary to keep him in position by the use of a knee pillow. Since the pressure of such may tend to the development of postoperative thrombosis, the patient is encouraged to move his legs as much as possible. On the morning after the operation, that is some 24 hours later, the patient is allowed a small cup of tea, about 1 to 1½ ounces, and during that day is given feeds of a similar quantity consisting of diluted milk, tea, or even a little chicken-broth.

Very frequently these cases show no postoperative vomiting, but if there has been any difficulty with the anæsthetic it is likely to be present. In such cases small doses of iced champagne of 1 to 2 drams in quantity will often give considerable relief. Actual obstructive vomiting, the so-called vicious circle, is today very rare, and is probably due in most cases to constriction of the opening in the mesocolon. Its presence is therefore rather an indication of an error in technique, and is due to the fact that a posterior gastro-enterostomy has been performed on a patient who has a fat or adherent mesocolon, or that the opening of the mesocolon has not been sutured to the stomach sufficiently far from the anastomosis. In all such cases it would have been better to have performed an anterior gastro-enterostomy. Sometimes this rare complication may be temporary and due probably to an œdema of the opening of the mesocolon rather than to a mechanical obstruction. Therefore, should frequent vomiting of large quantities persist after 24 hours, treatment should first be carried out in the belief that the condition is due to such œdema, before further operative treatment is considered.

The stomach should be washed out and the patient should be given 1 dram doses of suprarenal

extract in 1 dram of water every 6 hours for 6 doses. This drug was first given to control the loss of altered blood which was found in a case with dilatation, and it was seen that not only was the hæmorrhage stopped but the action of the stomach was enormously improved. Should there be no relief by these measures the case must be regarded as one of mechanical obstruction, and further operation considered. It must always be remembered, however, that such a complication should be prevented by correct operative technique rather than by the introduction of treatment after operation.

In uncomplicated cases the diet is gradually increased. On the second day a little jelly or junket may be added to the fluid which is administered by mouth, the quantities of which may be increased from 1 to 2 ounces at a time. On the third day a lightly-boiled egg may be given, and on the fourth day a little thin bread and butter without crust may be added. At this time Benger's food, boiled custard, and a few grapes may be allowed, after which time the diet is gradually increased by the addition of pounded fish, lightly-boiled fish, thin slices of chicken, etc., up to a full diet. At the end of a week the patient is taking a full and mixed diet, but it is important that the meals should be small and frequently repeated. A large quantity is more likely to give rise to symptoms than a variation in the quality.

On the evening of the second day a soap and water enema is given, or if there has been much distention and discomfort this may be administered even on the day after operation, but it is well to remember that the patient is much better if the bowels are given complete rest. The custom which is still sometimes advocated of giving the patient a large dose of castor oil on the third day after the operation is much to be deprecated. The use of so drastic a drug is quite unnecessary and often harmful. After the enema has acted, a mild aperient containing a little magnesium and sodium sulphate should be given in small doses.

The stitches are not removed until the tenth day, and on the eleventh day the patient is allowed out of bed for 5 minutes. At the same time, the use of bismuth and an alkali is commenced; a prescription containing 10 grains of bismuth carbonate, magnesium carbonate, and sodium bicarbonate is given 3 times a day, and the use of this is continued regularly until 3 months after the operation. The patient is allowed out of bed for increasing periods of time each day, and is advised to go away for a 2 or 3 weeks' holiday after the operation. He is permitted to leave the hospital on about the sixteenth day.

GENERAL REMARKS IN PROGNOSIS

By such a method the operative mortality is found to be relatively low and should not exceed 2 per cent, and even these figures will include the larger and more severe examples of ulcer; 90 per cent of the remaining patients will be completely cured and free from all symptoms; of the remainder, the majority may have infrequent attacks of vomiting and discomfort, and this is found practically wholly in women who are suffering from visceroptosis in addition to the lesser curve ulcer, a combination which is not uncommon. The symptoms are in fact due to the ptosis and not to any evil results of operation. Of after-complications gastrojejunal ulcer may be said never to occur in this type of lesion. The onset of carcinoma is very unusual. One case in my series developed later a pyloric carcinoma, and another a carcinoma at the site of excision; this, however, occurred relatively soon after operation, and was probably present at the time of the operation. In the later series more careful investigation of the symptoms and of the test meal has given rise in several cases to a suspicion of early carcinoma, and in these a partial gastrectomy has been performed instead of the excision. It is very probable, then, that the onset of carcinoma at a later date is due to an error of diagnosis and its occurrence should have been prevented by the use of other operative measures.

FROM THE WILMER CLINIC OF JOHNS HOPKINS HOSPITAL

IMMATURE CATARACT OPERATION FOR USE WHEN INTRACAPSULAR EXTRACTION SEEMS INADVISABLE

By CECIL H. BAGLEY, M.D., Baltimore, Maryland
Resident Ophthalmologist

ELDERLY people with immature cataracts are often advised to postpone any operation until the lens is completely opaque. But frequently relatively young people have partial cataracts which require many years to mature. In such cases, Dr. Wilmer performs a preliminary iridectomy with massage of the anterior capsule of the lens, followed by an extraction 3 weeks later. While the iridectomy does add an operative procedure, it possesses some distinct advantages. In addition to hastening the maturity of the lens, it enables the operator to discover any drug idiosyncrasy in the patient (atropine, mercuric bichloride, etc.), and it teaches the patient the proper operative and postoperative behavior.

A careful general examination is made which includes blood chemistry (especially in regard to blood sugar), white blood count, hæmoglobin, coagulation time, phthalein determination, urinalysis, nose and throat, teeth, basal metabolic rate, and lens sensitivity test. The last mentioned is regarded as most important, especially in cases of immature cataract when there is a possibility of any soft lens matter being left behind. If patients are found sensitive to lens protein, they are desensitized by repeated doses of increasing strength until immunity is produced.

After all sources of toxæmia, focal infection, or conditions which reduce tissue resistance, are excluded or improved, the patient is admitted to the hospital the day before operation.

PRE-OPERATIVE TREATMENT

In every intra-ocular operation, a scraping is taken from the conjunctival sac, from which a culture and smear are made to determine the organisms present. Ten per cent argyrol instillation into the cataractous eye is followed by boric acid irrigation every 2 hours. At 7:00 p. m. on the day preceding operation, the house surgeon goes to the patient's room and instills 2 drops of 1 per cent butyn into each eye. He then instructs the patient to close the eyes while he gently scrubs the entire face and eyelids with green soap for 5 minutes, working up a good lather over the entire face. This is then washed off with 1:10,000 bichloride and sterile water, and the eyes irrigated with boric solution. The upper lashes are covered with 1:10,000 bichloride salve and then trimmed close to the lid margin with small, straight scissors. The salve is used to keep the lashes from getting into the eye. Following this, the eye is again irrigated with boric acid, the conjunctival sac is completely filled with 1:10,000 bichloride salve, and the eye bandaged for the night. Orders are then given for a mild cathartic such as phenolax. It has been found very necessary that the patient should have a good night's sleep before the operation. For this reason mild sedatives such as sodium bromide, luminal, or allonal are prescribed if necessary.

At 6:00 a. m. on the day of the operation the patient is given a soapsuds enema; at 7:30 a. m. a slice of toast and a cup of tea. At 8:00 a. m. the house surgeon removes the dressing, instills 10 per cent argyrol, followed by boric irrigation, then instills one drop of 1 per cent butyn into each eye. Gentle pressure is applied to the lachrymal sac to evacuate any possible contents through the canal, and the patient's face is again scrubbed with green soap for 5 minutes. This is followed by bichloride and sterile water, the eyes being thoroughly irrigated. A sterile eye pad is then placed over the eye until 8:30 a. m., when the patient is given 20 grains of sodium bromide and ½ grain of codeine, by mouth, and the nurse in charge begins the 1 per cent butyn drops in the cataractous eye, continuing these drops every five minutes until 9:00 a. m., at which time the patient is taken to the operating room.

PRELIMINARY IRIDECTOMY

The patient walks to the operating room. One drop of 1 per cent butyn is instilled into the eye that is not to be operated upon. This is done to keep the soap from irritating the eye. For the third time, the face is scrubbed with green soap for 3 minutes and rinsed with 1:10,000 bichloride and sterile water; ½ cubic centimeter of 1:100 procaine with adrenalin is injected subconjunctivally below the cornea of the eye to be operated upon. The patient is draped with head towel and a large sheet which covers the entire

Fig. 1. Small instrument with which surgeon massages anterior capsule of lens to hasten maturity.

Fig. 2. Instrument used to extract lens.

body. Then a special eye drapery of dark green cloth is placed over the head. This cloth, 90 centimeters square, has an oval opening approximately 7 by 14 centimeters, through which the surgeon operates. Immediately before the speculum is inserted, several drops of adrenalin and 4 per cent cocaine are instilled into the eye to be operated upon.

After the speculum has been inserted, the eye is grasped with fixation forceps below the cornea, and the keratome is inserted at the limbus in the midline above. The knife is passed well across the anterior chamber making a good wide incision. As it is withdrawn, the iris usually follows it with the escape of aqueous. The prolapsed iris is withdrawn through the wound and excised in the usual manner. The surgeon inserts a small instrument (Fig. 1) with which he massages the anterior capsule of the lens to hasten its maturity. The pillars of the coloboma are replaced and the speculum removed. The eye is dressed by putting a small amount of 1 per cent atropia salve into the conjunctival sac toward the outer canthus, and by completely filling the remaining portion of the sac with 1:10,000 bichloride salve. Both eyes are bandaged and Ring's ocular mask applied. A stretcher is brought into the operating room; and after the table has been adjusted to the same height as the stretcher, the patient is transferred by four assistants, one at the head, one at the foot, and one on either side of the canvas band passing beneath the patient's back. This transfer to the stretcher is made without the slightest bit of effort on the part of the patient.

POSTOPERATIVE ORDERS

1. The patient is to remain flat on his back in bed for 5 hours.
2. The diet for 24 hours is to be liquid.
3. Bowels are to be moved 48 hours after operation.
4. All brilliant daylight is excluded; the room to be illuminated by a specially constructed floor lamp placed beneath the bed.
5. The patient is to have 20 grains of sodium bromide if discomfort should arise.
6. The house surgeon is to be called if the patient should have any discomfort.

On the day following the operation, the surgeon removes the bandage, taking every precaution not to hurt the patient, lest the patient should squeeze the eyelids together and injure the eye. For this reason the silk adhesive which holds the eye bandage in place, is soaked off and *never pulled*. The eyelid is carefully opened by the surgeon and his assistant, who instruct the patient not to make any voluntary movements whatever. The cornea is examined with candle light only. A 10 per cent solution of argyrol is instilled into the lower conjunctival sac and allowed to remain there 2 minutes, after which the eye is irrigated with boric solution. The lower cul-de-sac is then filled with atropia and bichloride salve, the skin around the eye gently wiped with boric acid solution, and an eye pad and bandage applied to the eye operated upon, leaving the good eye free. This dressing is continued until the seventh day after the operation. On the eighth or ninth day, the patient is discharged from the hospital with the following instructions:

DIRECTIONS FOR MR. X

1. Three times a day, one or two drops of boric acid solution should be instilled into the eye that has been operated upon.
2. Atropia is to be used only in case of irritation.
3. Be very careful about exposing the eye operated upon to bright light or wind. The other eye should be used only for the most necessary things.
4. Three weeks after the preliminary iridectomy, the patient can return to the hospital for removal of the cataract.
5. In case the eye should give any trouble, immediately consult an oculist or take the first train for the Institute.

When the patient returns to the hospital, an interval history is taken in which everything of importance is noted. Conjunctival scrapings and culture are taken, urinalysis and blood count are made, and the patient is prepared for operation on the following day in the same manner as for preliminary iridectomy; but in addition, the pupil is dilated by atropine.

EXTRACTION

The patient walks to the operating room, having received 20 grains of sodium bromide and ½ grain of codeine, 15 minutes previously. After being comfortably placed on the operating table with a rubber sheet across the lumbar region to prevent postoperative discomfort, the eyes are scrubbed for the third and last time with green soap and

irrigated with bichloride and sterile water. The innervation of both the upper and lower lids is then blocked by subcutaneous infiltration of both lids with 1:100 procaine containing 4 minims of adrenalin to the ounce. This is considered a most important step in cataract extraction, as it prevents the patient's closing the eyelids or exerting any pressure on the eyeball after section has been made, which might result in the loss of vitreous. This injection, in addition to the butyn every 5 minutes for ½ hour preceding operation, and 20 grains of sodium bromide, gives complete anæsthesia and relaxation, no pain whatever being experienced during the operation. Just before the speculum is inserted, the patient is requested to look to the right, to the left, up and down, and is told that during the operation he is to think before moving the eye when requested, and not under any condition to move it except when requested.

The section includes the upper two-fifths of the cornea at the limbus, having a conjunctival flap of 2 to 3 millimeters at the top. At this step, the speculum is removed and a Fischer's hook inserted beneath the upper lid, where it is held in place by an assistant. This lifts the lid entirely away from the eye, giving good exposure and taking the weight of the lid from the incised eyeball. After the Fischer's hook is properly placed, a capsulotome is passed through the incision and a portion of the anterior capsule of the lens is excised.

Through this opening in the anterior capsule, the lens comes forward against the posterior surface of the cornea. Gentle pressure is then made by an instrument (Fig. 2) at the limbus below and the lens is extracted. When the cataract is completely matured, there is no soft lens matter remaining behind, the pupil looks perfectly clear and black, and generally there is no need for irrigation of the anterior chamber, though occasionally it is found necessary. The pillars of the iris are carefully replaced by a small, thin spatula to prevent any incarceration of the structures in the wound. The Fischer's hook is removed and the lids carefully closed over the eyeball. A small amount of 1 per cent atropia salve is placed in the lower cul-de-sac toward the external canthus, the conjunctival sac is filled completely with 1:10,000 bichloride salve, both eyes are bandaged, and Ring's ocular mask applied. The patient is returned to the ward on stretcher with the same orders as those issued after preliminary iridectomy.

On the following day, the surgeon in charge removes the bandage from the eye operated upon, the lids are not opened but are inspected externally, and if there is no swelling or secretion, he is reassured that everything beneath is going well. The skin about the eyelids is gently cleansed with boric acid solution, a small amount of 1 per cent atropia salve is applied along lid margins, and both eyes are again bandaged.

On the third day after operation the dressing is removed and lids are inspected, but this time the lower lid is pulled down just a trifle so that the lower cul-de-sac may be seen, a drop of 10 per cent argyrol is instilled into the cul-de-sac and irrigated out with boric acid solution, the cornea not being exposed. The patient is still on liquid diet to prevent the muscles of mastication from causing any undue pressure on the eyeball. For the same reason, he is not allowed to smoke.

On the fourth day, the lids are very gently pulled apart by the surgeon and his assistant, the patient remaining absolutely passive during this procedure. The cornea is then seen for the first time, and the conjunctiva at this dressing appears practically normal. Ten per cent argyrol is instilled into the eye and irrigated out with boric acid solution. Atropia and bichloride salve are placed in the lower cul-de-sac and the eye dressed. The patient is allowed to sit up out of bed for an hour in the morning and an hour in the afternoon. A soapsuds enema is given and he is put on medical soft diet. The eye operated upon is bandaged 7 days, and its fellow 4 days. The patient is usually discharged from 9 to 14 days after the operation, with the following instructions, and advised to return to the Institute 6 weeks later for refraction, if possible.

DIRECTIONS FOR MR. X

1. Four times a day, several drops of the boric acid solution (the larger bottle) should be instilled into the eye operated upon.
2. Every morning, one or two drops of the atropia solution (the smaller bottle) should be put into the eye operated upon, in case there is any irritation.
3. Twice a day, bathe the eye for 5 minutes with hot water followed by a dash of cold.
4. Be careful for 2 weeks about exposing the eye to bright light or wind. Dark glasses should be worn in all bright light, and a pad should be put over the eye if exposed to wind or dust.
5. The good eye should not be used for anything for 1 week.
6. If there should be any trouble with the eye, immediately consult an oculist, or take the first train for the Institute.

FROM THE OBSTETRICAL CLINIC, CHICAGO LYING-IN HOSPITAL

THE PRINCIPLES OF THE TECHNIQUE OF THE SECOND STAGE OF LABOR

By J. B. DeLEE, M.D., F.A.C.S., Chicago

DURING the few hours comprising the second stage of labor, many babies and not a few mothers die, and many invalids, mostly permanent, are made. It is imperative, therefore, that the accoucheur be in personal attendance on the parturient or be represented by a competent assistant as soon as the cervix is completely dilated, that is, the second stage is begun; and that he remain by the patient's side until the labor is completed.

The duties of the obstetrician during this critical period may be classed under 5 headings: (1) protecting the parturient from infection; (2) preventing injury; (3) relieving her of excessive pain; (4) preserving the life and health of the child; (5) preventing complications. While the average practitioner will obtain a certain meed of success in the routine treatment of the labor case, he will require more than the usual amount of brains and of skill to perform all these duties well and pilot the mother and baby safely through the perils which menace both from all sides. The accoucheur will therefore need to devote all his time and all his talents to the mother and baby during this period of labor.

Protecting the parturient from infection consists not alone in carrying out in the minutest detail the principles of asepsis and antisepsis but in so fortifying the woman's system that she can and will throw off any invading army of bacteria.

It should be and probably would be insulting to the reader if I were to say that he must conduct a labor with the same painstaking regard for asepsis and antisepsis as that practiced by the surgeon in the surgical operating room. Vital statistics show that over 5,000 women die of puerperal infection every year in the United States. It is, therefore, needful to say that the parturient woman requires and deserves an even more perfect aseptic technique. Each labor should be conducted with the same care as that used in a vaginal hysterectomy. Obstetrical cases in general hospitals are especially apt to become infected and therefore need particular isolation, and isolation is permanently effectual only with architectural separation of the maternity from the general medical and surgical wards.

Fortifying the system against bacterial invasion involves the proper preparation of the gravida for her ordeal and the conduct of the long first stage of labor so as to avoid dehydration, starvation, acidosis, and nervous and physical exhaustion. It also means proper conduct of the delivery itself so as to prevent, first and most important, loss of blood, even minimal amounts; second, exhaustion from prolonged natural effort; third, shock, mental and physical; fourth, undue traumatism, natural and artificial.

I cannot discuss all these important things in detail. By preparing the gravida I mean that throughout pregnancy the woman should be made to exercise and to eat properly, she should be watched for focal and general infections, heart, kidney diseases, etc., and all such conditions corrected as far as possible—in short, adequate prenatal care should be given her. During labor, food, water, rest, and mental encouragement are to be provided. The second stage should not be allowed to drag on indefinitely but the watchful accoucheur should determine, "not what nature can endure but what she can accomplish."

Long before the first labor pain has occurred the attendant must have made up his mind whether or not the case is a normal one as far as mechanical disproportion is concerned. Prolonged pounding of the head against the inlet or the pelvic floor results in traumatism which invites infection, but improperly performed delivery by the accoucheur will cause more damage and give rise to more infection than natural delivery. Besides, an obstetrician who does not know how to operate usually also does not know how to be clean, that is, does not carry out a perfect aseptic technique. Unless, therefore, the attendant really can improve on nature he had better leave her alone, and interfere only in the presence of immediate danger to mother or child. In all necessary operations, traumatism of the tissues should be reduced to an insignificant minimum. Healthy tissues resist infection. Traumatized structures invite its entrance. The Latin motto which the old accoucheurs engraved on their forceps should be respected:

Non Vi—Sed Arte

There is a curious superstition that a patient can and should lose blood during labor, and that a bloodless labor, while not harmful, is abnormal. I would prefer all labors to be bloodless, being certain that the women would have less postpartum infections, nurse their babies better, and recover their strength much quicker. It is wise, therefore, during the second stage to preserve the woman's blood reserve intact—she will always lose more than is good for her in the third stage.

Prevention of injury, in addition to its guarantee against infection, safeguards the woman's future health. The connective tissue and fascial supports of the cervix, bladder, vagina, rectum, and pelvic floor must be preserved or else the woman will suffer in later years from greater or less degrees of prolapse of the pelvic organs. A certain amount of damage is inevitable during the passage of the child, especially in women of the enteroptotic type, those with a congenital weakness of all mesoblastic structures. In these women all we can save is the perineum, and not always that. Cervical tears, while common in operative deliveries, occur frequently in spontaneous labors, and the same applies with greater force in respect to the pelvic floor.

Reduction of such damage is effected by allowing the natural powers to bring the head down to and between the levator ani pillars. The bearing down efforts of the woman, instead of being spurred on by the attendant as is generally done, are to be restrained and moderated by instructing the parturient how best to use her powers, or by the judicious employment of anæsthetics. Urging the parturient to "bear down" incontinently is too often an evidence of the attendant's desire to hurry the labor and curtail his expenditure of time, rather than an evidence of the exigencies of the case. A slower dilatation of the parturient passage would be better for the soft parts and the baby's brain.

The obstetrician should understand the natural mechanism of labor and should closely observe its development by abdominal and rectal examination in each particular case. He should know how to direct the powers of labor to the best advantage by external measures, for instance, how to favor anterior rotation of the occiput, how to deliver the head and shoulders with their smallest diameters presented to the girdle of resistance. In short he must be an obstetrician, not a midwife "watching a hole."

One of the greatest crimes against the integrity of the pelvic connective tissues and the baby's brain and life, is the routine use of pituitrin to hasten the second stage of labor. I am not sure that a parent could not recover damages at law if it were proved that a baby was lost, or the mother injured by her attendant administering pituitrin in an apparently normal labor.

A timely episiotomy will often save the perineum from more extensive damage and at the same time relieve the baby's head from injurious pressure, while in the hands of an expert obstetrician, protected by the ponderous aseptic technique of the special maternity, the forceps may occasionally be used to effect delivery with a minimum of danger to both mother and child. It will bear repetition, however, that those hands into which the majority of labors fall will do less damage to mothers and babies if they are kept off until nature shows some signs of being unable to bring the case to a happy conclusion.

The relief of pain during the second stage is one of the prime duties of the accoucheur. It is true that all anæsthetics carry some degree of danger to both mother and baby, but on the whole the advantages outweigh this. The prevention of psychic shock is one of them, and the restraining of too powerful expulsive efforts is another. It was stated above that too rapid delivery is undesirable.

There are several claimants for favor in the field. Chloroform still has many advocates but obstetricians are giving it up one by one as cases of late poisoning develop in their practice. Nitrous oxide and oxygen are preferred by many who have not yet tried ethylene. Of the two gases the latter seems to be the more successful since it does not cause cyanosis, is more relaxing, leaves less headache, and does not cause any more bleeding. Its great inflammability is a drawback but this can be reduced to safety—almost—by using a water machine, zeppelin-painted, and by grounding the machine, patient, operator, and all who enter the room, to get rid of "static." For short deliveries in multiparæ—for short operations not involving much cutting and suturing, ethylene may be used. My own preference is for ether, throughout the second stage and for perineal repair. Rarely one can use local anæsthesia with ½ per cent novocain.

The preservation of the life and health of the child, needless to say, is of importance secondary only to that of the mother. But it is needful to say that in the practice of most obstetricians both the life and the health of the child are not considered as requiring any special attention on their part. At least one must so decide upon observing the neglect the child suffers before he is born and the rough handling he gets while being brought into the world. Some men never listen

to the baby's heart in the second stage and are astounded when it comes into the world dead. Others listen so infrequently that a child could die ten times between two auscultations. It is necessary, in order to detect the earliest signs of fetal distress, to listen to the heart every 2 to 5 minutes and in questionable cases, continuously. For this purpose the accoucheur will find the head stethoscope most convenient, indeed indispensable. When the fetal heart beats as low as 100 or less the child is in danger and needs to be removed, and this should be done if the conditions are right.

I have seen men yank a child out of the womb with the gentleness of a coal-heaver, and expect the baby to live through the experience. A baby is a tender organism, particularly its brain, and it should be handled with great delicacy. We may, by ungentle manipulation, injure the brain and, while life is not affected, the child later may develop paralysis, paresis, mental disorder, or deficiency. Prolonged compression of the brain by the natural forces of labor will cause as great damage as imperfect operative delivery. This must be avoided by the help of art, appropriately timed. During the child's birth, its eyes, lungs, navel, intestinal canal must be securely protected against infection—not an easy task.

Preventing complications. How few men conducting the second stage actually think of the most common possible complications! They cannot even be said to be "waiting for something to turn up" except the exit of the baby. Abruptio placentæ, rupture of the uterus, eclampsia, cardiac collapse, all occur occasionally during this period of labor and their remoteness or imminence should be promptly recognized. If the signs and symptoms of abruptio placentæ suddenly appear, prompt extraction will save the child—and the mother too. Obstruction to delivery leading to rupture of the uterus is easily discovered but tumultuous pains can burst a uterus even when there is no mechanical obstruction. Then deep anæsthesia will save the woman's life. Cardiac disease may show itself for the first time during the second stage of labor. Many cases of "obstetric shock" are really cardiopathies. A close watch of the parturient's heart, which is rendered so easy by the head stethoscope, would have warned the obstetrician in time.

I will conclude by quoting two very trite sayings, truer nowhere than in obstetrical practice and truest and most applicable to the second stage of labor: "It is always the unexpected that happens." "Eternal vigilance is the price of success."

SOME TYPES OF HARELIP AND CLEFT-PALATE DEFORMITIES AND THE OPERATIVE RESULTS[1]

By WARREN B. DAVIS, M.D., F.A.C.S., Philadelphia

SURGICAL literature is replete with the many varieties of operations which have been devised for the correction of harelip and cleft-palate deformities. This very multiplicity probably indicates that none is entirely satisfactory. Through the courtesy of Dr. J. Chalmers DaCosta, it has been our privilege during the past 10 years to have charge of the harelip and cleft-palate cases admitted to Surgical Division A at Jefferson Hospital. We have utilized this opportunity to observe the relative merits of the methods impressing us as being best adapted to each type of deformity which has occurred in our series of 327 cases. Thus our technique is a composite one, in which may be recognized the assembling of elements taken chiefly from the basic principles and procedures evolved by Langenbeck, J. Ewing Mears, W. J. Roe, G. V. I. Brown, V. P. Blair, J. E. Thompson, J. S. Davis, Berry, and Legg. In addition there are some modifications and variations which naturally develop as a personal element in one's surgical work.

We shall consider here a few of the varieties of deformities, briefly describe the types of operations used in their correction, and show by photographic records the pre-operative conditions and the results obtained.

Incomplete and complete unilateral harelip deformities are best corrected by practically the same general plan of treatment. In the cases in which the cleft extends only partially through the lip (Fig. 1), there is little or no muscle tissue between the superior angle of the cleft and the floor of the nostril; thus the degree of the deformity which is shown in the deviation of the nasal septum to the opposite side, the widening of the nostril and the associated flattening of the ala may sometimes approach that found in cases of complete harelip (Fig. 3). To correct these deformities and obtain the best functional results, the ala must be brought into proper relation to the septum, the deviation of the septum corrected, muscle tissue approximated in the closure of the cleft, the lip made the proper length, and exact alinement of the vermilion borders secured (Figs. 2 and 4).

In outlining the incisions we have found the method devised by J. E. Thompson to be most satisfactory (Fig. 5). It insures the lip being the desired length and of sufficient fulness at the margin. At the time of operation the marginal fulness may appear excessive, but after a few months it is usually found to have been an allowance just sufficient to balance properly the contraction which later occurs in the suture line. In very few instances have we had excess fulness to persist, a condition which is readily corrected by a slight secondary adjustment. Incomplete clefts

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1. Case 1. Infant, age 7 months, with incomplete unilateral harelip, showing absence of muscle tissue between superior angle of cleft and floor of nostril, deviation of nasal septum, and flattening of the ala.

Fig. 2. Case 1, showing contour of lip and nostril 10 months after operation.

Fig. 3. Case 2. Child, 12 months old, with unilateral harelip. Note deviation of nasal septum, flattening of ala nasi, and consequent widening of nostril.

Fig. 4. Case 2, showing contour of lip and nostril 5½ years after operation.

[1]Read before the Clinical Congress of the American College of Surgeons, Philadelphia, October 31, 1925.

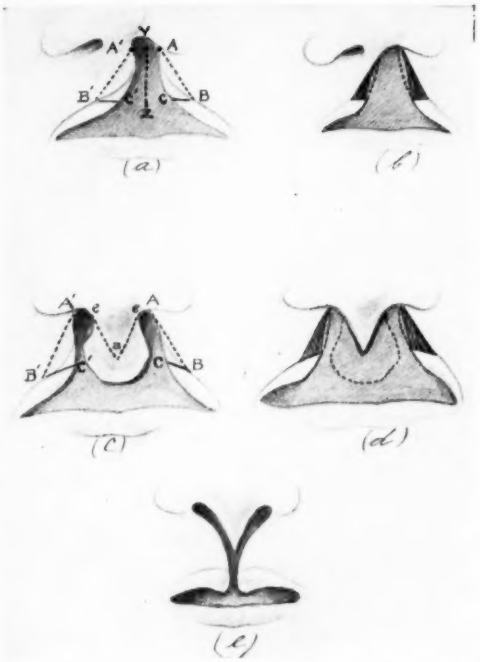

Fig. 5. Semidiagrammatic sketches, showing lines of incisions used for the correction of single and double harelip. (After methods of J. E. Thompson.) In single clefts, Sketch *a*, sharp pointed calipers are used in measuring the distance *YZ* from the midpoint of the floor of the nostril to the point in the same sagittal plane to which the free margin of the lip would come if it were of normal contour. Fixing the distance on the calipers and keeping the superior point at *Y*, the inferior point of the calipers is rotated describing an arc which crosses the vermilion border of the lip on either side of the cleft. These points *B* and *B'* are distinctly marked by making a puncture with the point of the calipers or with a small scalpel. Points *C* and *C'* are then located on the free margin of the lip so that the angles *ABC* and *A'B'C'* are between 70 and 80 degrees. Incisions carried through the entire thickness of the lip with a small scalpel at a right angle to the skin surface and following the lines as outlined will give surfaces for approximation which are of equal length and which, when sutured together, will give a lip the length of which is the estimated normal length *YZ* plus the distance from the vermilion border to the free edge of the lip *CB* which is usually just sufficient to allow for subsequent contraction. Sketch *b* shows tissue removed. Lines of incision used in double harelip are shown in Sketch *c*. The philtrum is trimmed to a V-shape, leaving as much tissue as is possible with thorough removal of the vermilion borders. The lateral incision lines are outlined as described for single harelip. Sketches *d* and *e* show tissues ready for approximation.

are converted into complete ones by incisions which are carried well up into the floor of the nostril, where sufficient tissue is removed to allow

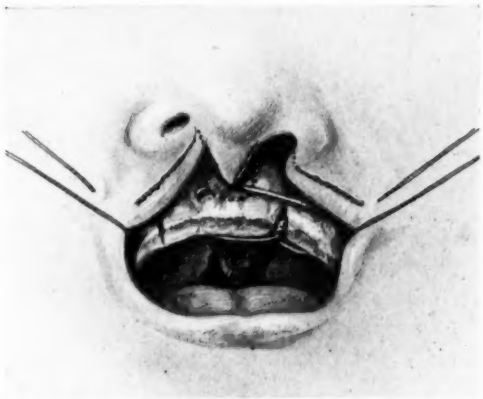

Fig. 6. Sketch showing location of partial division of alveolar process to allow premaxilla to be brought into nearly normal position. The philtrum has been trimmed to a V-shape just within the vermilion borders. Temporary traction sutures are in position just above vermilion border of lip and lateral to points outlining incisions.

proper adjustment of the ala. The ala, the lip, and the antero-inferior portion of the cheek must be sufficiently freed from the anterior maxillary wall to permit approximation without undue tension. Trauma to the lip and consequently the resulting scar tissue, we believe, is minimized by the use of temporary traction sutures placed just above the vermilion border and lateral to the outlined incisions, instead of forceps (Fig. 6). Special attention should be given to correcting as far as possible the deviation of the nasal septum. In infants and in young children, forcibly pressing the septum over with a small Sinexon nasal dilator may be sufficient, since the subsequent gentle traction of the reconstructed lip and floor of the nostril tends to overcome the anterior deflection (Fig. 2). In older patients, however, our best results have been secured by separating the muco-periosteum from each side of the base of the septum, through an incision made transversely underneath the lip at its attachment to the antero-inferior portion of the septum, and then dividing submucously with a small thin chisel the attachment of the septum to the intermaxillary ridge. This allows the septum to be placed approximately in the median line, and not only improves the cosmetic result but also increases and equalizes the nasal respiratory area (Figs. 20 to 22 and 27 to 30). If an obstructing septal ridge is present it should be removed submucously at a subsequent operation.

In cases with both harelip and cleft palate we do the operation in two stages, closing the alveolar

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 7. Case 3. Infant, age 5 months, with complete unilateral harelip and cleft palate.

Fig. 8. Case 3, showing contour of lip and nostril 25 months after operation.

Fig. 9. Case 4. Infant, age 10 weeks, with complete unilateral harelip and cleft palate. The cleft extends almost into the orbit.

Fig. 10. Case 4, 8 months after operation. A second operation will be done at an early date to bring the ala nasi into better position.

cleft and repairing the harelip as soon as the child is in condition to stand operative procedures. This should be done sometime between the eighth day and the third month. The remaining portion of the cleft is repaired at the second-stage operation which should be performed sometime between the twelfth and twentieth months, the time depending upon the child's general health and nutrition.

Narrow alveolar clefts in infants with only moderate rotation of the premaxilla may be closed by firm digital pressure on the premaxilla supplemented by inferomedial pressure against the floor of the nostril and base of septum by means of a small nasal dilator. When the alveolar margins are brought into contact they are held in that position by a silver wire suture passed through the upper portion of the alveolar process. In older children and in cases in which the alveolar cleft is wide, or in which the premaxilla is markedly rotated, we usually partially divide the alveolar process on the buccal surface just posterior to the

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 11. Case 5. Infant, age 4 months, with bilateral harelip and cleft palate. The entire philtrum was utilized in the repair of the lip, each cleft was closed as it would have been if we had been dealing with a case of unilateral harelip.

Fig. 12. Case 5, 14 months after operation.

Fig. 13. Case 6. Infant, age 2 months. Bilateral harelip and cleft palate of unusual width. Marked rotation of premaxilla, columella, and philtrum very small.

Fig. 14. Case 6, one year after operation.

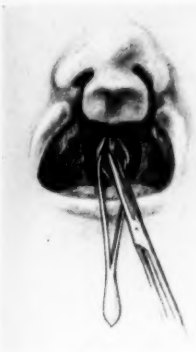

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

Fig. 19.

Fig. 15. Sketch shows position of incision for removal of lower portion of vomer and anterior portion of nasal cartilage by submucous resection. A triangular section of bone and cartilage was removed to allow inferoposterior rotation of premaxilla to its normal position. The length of the base of the triangular piece of bone and cartilage removed is determined by the amount of rotation which the premaxilla requires, and should be such that when the premaxilla comes into proper position the sides of the triangle will be brought together. There will be a bulging of the mucoperiosteum at this point for several days, but the excess tissue soon resorbs.

Fig. 16. Lateral margins of premaxilla and the margins of alveolar process have been trimmed to allow accurate approximation of raw surfaces. Silver wire has been tightened to hold premaxilla in proper position.

Fig. 17. Case 7. Infant, age 5 weeks. Complete bilateral harelip and cleft palate. Note elongation of vomer, rotation of premaxilla, and shortness of columella. Philtrum is rather well developed.

Fig. 18. Case 7. Three-quarter view of condition mentioned in Figure 17.

Fig. 19. Case 7, age 17 months. Showing contour of lip and nostrils, 15½ months after operation. Note development of columella. Secondary operation will be done to further adjust the lip margins.

canine area with a thin chisel. Firm pressure on the premaxilla produces a green-stick fracture at the site of the partial division, and thus allows the alveolar cleft to be closed with the premaxilla in approximately normal position (Fig. 6). The mucous membrane is removed from the margins of the alveolar cleft before the silver wire which holds the margins in apposition is tightened and twisted. Fibrous union is thus secured. If a greater amount of tissue be removed in an infant in an attempt to secure bony union, there will probably be an early eruption and loss of a tooth on one or both sides of the cleft. After thus closing the alveolar cleft we repair the cleft in the lip by the same method (Fig. 5) as described in the correction of simple harelip.

In the correction of bilateral harelip the incisions shown in Figure 5 are used if the philtrum is small, though we do not remove as much of the tissue from the margins of the philtrum as the artist has indicated in that illustration. When the philtrum is sufficiently large, even though the columella be short, the entire philtrum is preserved. Incisions are made so that the lateral portions of the philtrum are turned down after which the cleft on each side is repaired independently. The lateral portions of the lip are usually thicker than the philtrum; thus secondary operations to make this inequality less conspicuous may be necessary (Figs. 11, 12, and 17 to 19). When clefts in the lip are quite wide, so that in spite of extensive freeing of the alæ, lips, and cheeks from the anterior surfaces of the maxillæ there is still tension on the suture line, a single shotted-stay-suture of silkworm gut is applied after the method of G. V. I. Brown. Such a suture produces very little scarring and often less fibrous tissue in the suture lines (Fig. 19).

Complete bilateral clefts of lip and palate often have marked anterosuperior rotation of the premaxilla and elongation of the vomer (Figs. 13, 17, and 18). Such deformities can best be corrected by resecting a triangular section from the inferior portion of the vomer as shown in Figures 15 and 16. The base of the triangle should be just long enough for the rotation of the premaxilla into the position which completes the alveolar arch. If such resection, or some similar procedure, is not done, and the premaxilla is forcibly replaced, a degree of deflection of the nasal septum will be produced, which will markedly obstruct one or both of the nasal passages.

Fig. 20. Fig. 21. Fig. 22.

Fig. 20. Case 8. Girl, age 15 years, with complete unilateral harelip.
Fig. 21. Case 8, showing degree of deviation of septum and flattening of ala nasi.
Fig. 22. Case 8, age 16 years, showing contour of lip and nose 6 months after operation.

In the repair of cleft palates we most frequently use the Langenbeck incisions, through which mucoperiosteal flaps are loosened from the rudimentary horizontal portions of the palate and maxillary bones. In cases of wide single unilateral clefts in the palate we have often utilized successfully some of the mucous membrane from the lower portion of the nasal septum, increasing to that extent the width of the flap and thus avoiding tension on the suture line.

We have gotten our best results from the use of No. 00 wire sutures in the mucoperiosteal portions of the flaps and black silk sutures in the soft palate. One silk on-end mattress suture is used near the junction of the soft and the hard palate to insure broad and exact coaptation of the flaps at that point. In our experience the use of multiple on-end mattress sutures interferes sufficiently with circulation to cause varying degrees of non-union in too high a percentage of cases to make their use advisable.

In a small percentage of the cases in our series (approximately 4 per cent) there was sufficient development of the horizontal portion of the rudimentary palate and maxillary bones to make it permissible to attempt bringing a portion of bone over with the flaps (Figs. 23 and 24), a method originally devised by Ferguson, used in Philadelphia for many years by J. Ewing Mears and later, revived, improved, and most successfully used by

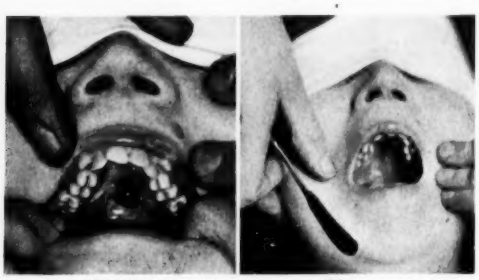

Fig. 23. Fig. 24.

Fig. 23. Case 9, age 17 years. Opening in hard palate persisted after an operation for bilateral cleft palate which was done when patient was 1 year old.
Fig. 24. Case 9. Photograph of palate, 2 months after operation.

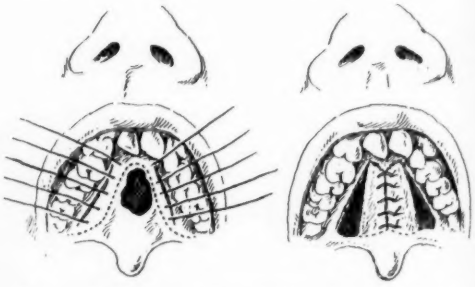

Fig. 25 (left). Semidiagrammatic sketch of Case 9. Dotted line indicates margins of bony cleft. Wire sutures, size 00 are shown in position.
Fig. 26. Semidiagrammatic sketch of Case 9, showing approximation of the margins of the opening in the hard palate. The site of the green-stick fracture is indicated as are the posterior ends of the bones in new position.

Fig. 27.

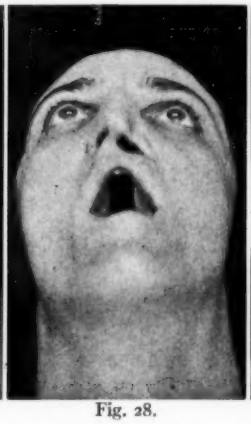

Fig. 28.

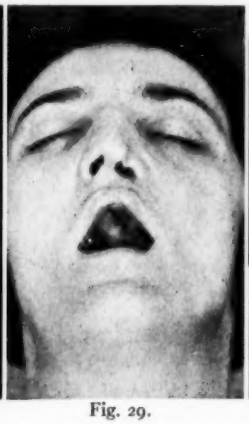

Fig. 29.

Fig. 30.

Fig. 27. Case 10, age 28 years. Unilateral harelip, bilateral cleft palate. Lip had been operated upon when patient was 2 years old, and again when 16 years old. Note that vermilion border was not properly removed from margins of cleft in lip, persisting as a disfiguring red line extending to floor of nostril.

Fig. 28. Case 10, showing deviation of the nasal septum, flattening of ala nasi, and contour of nostril. Wide bilateral cleft of palate.

Fig. 29. Case 10, showing condition 7 weeks after operation on palate, 4 weeks after operation on lip.

Fig. 30. Case 10, showing contour of lip and nostril, 5 months after second operation.

our own W. J. Roe in many of his cleft-palate operations. Cases in which this procedure can be successfully utilized give better length and more firmness to the palate than those in which mucoperiosteal flaps alone are used. If the operation is unsuccessful, however, and the bone flap is lost from necrosis, the prospects of a successful secondary operation are much less hopeful than had mucoperiosteal flaps alone been used. In 20 per cent of the cases in which we have attempted this method of closure such necrosis did occur, but the results obtained in the other cases were so satisfactory that we believe that its use is advisable in carefully selected cases. We have utilized Lane flaps only in the secondary closure of persisting openings just posterior to the alveolar margin.

In all patients who have had cleft-palate operations special training is needed for the correction of the speech defects and whenever the location of the patient's home is such as to make it possible to secure proper instruction, it is important that the surgeon urge this need upon the parents of the children, or upon the individual in the case of an older patient.

The teeth are usually of inferior quality and require special care for their preservation. In all cases in which the clefts involve the alveolar process and in many in which the clefts are partial, some degree of orthodontic work is required after the eruption of the permanent teeth, to effect proper occlusion and to lessen the asymmetry in the dental arch.

A METHOD OF OBTAINING GREATER RELAXATION WITH WHOLE THICKNESS SKIN GRAFTS[1]

By JOHN STAIGE DAVIS, M.D., Baltimore
AND
HERBERT F. TRAUT, M.D., Baltimore
Rockefeller Fellow in Plastic Surgery

WHEN a considerable area of scar tissue has replaced the full thickness of the skin and sometimes also the underlying tissues, contracture usually follows. This contracture varies according to the size of the surface involved and the depth of the scar. The statement is frequently made that in the relief of scar contractures in plastic surgery, the scar tissue should always be completely excised before reconstructive work is done, and this is a good working rule in certain types of scar and in certain situations. However, when the scar is so extensive that complete removal is impossible even by gradual partial excision, we have to resort to one means or another to relieve the contracture. Among the methods employed may be mentioned the lengthening of the contracted bands by Z shaped incisions and closure, after shifting the flaps thus made; excision of the binding portion with the insertion of pedunculated flaps from neighboring tissues or from distant parts; excision of or relaxation by division of the binding portion of the scar followed by skin grafting of the defect thus made.

In some instances, the scar is so extensive that the neighboring tissues cannot be utilized for pedunculated flaps. In others, it is not advisable to make more scar than is already present. In still others, the irksomeness of the Italian method must be avoided. These cases must then be treated in either one of two ways: by the shifting of scar flaps, if they are not too rigid; or by the implantation of skin grafts after the tension bands have been either excised or relieved by division.

There is no doubt that whole thickness grafts are more satisfactory for this purpose than either Ollier-Thiersch or "small deep" grafts, and in consequence this type of graft should be used.

Blair has evolved a useful method of increasing the raw surface after complete excision of a scar in order to use a larger whole thickness graft. He undermines the skin edges and turns them outward, so that the raw surface is increased by almost twice the area of the undermining. He passes sutures in such a way that the undermined margins are turned skin surface to skin

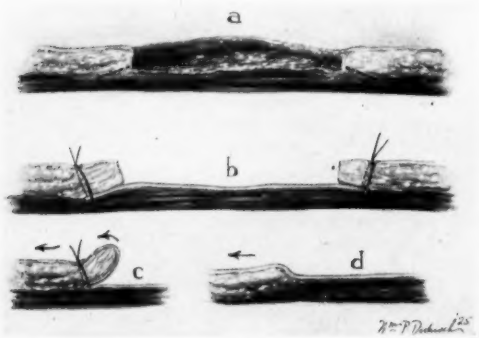

Fig. 1. *a*, Schematic drawing showing a defect made by the removal of the binding portion of an extensive scar. The dotted lines indicate the incisions made to undercut the scar edges all around the defect. *b*, Shows the edges undercut and raised. The whole thickness graft is drawn as far back under the undermined area as possible and is held in position by sutures. *c*, Indicates the junction of the epithelium from the scar margin and the margin of the graft. The upturn of the margin is somewhat exaggerated. *d*, Indicates the gradual flattening of the edges, which finally become level or almost level with the surrounding scar.

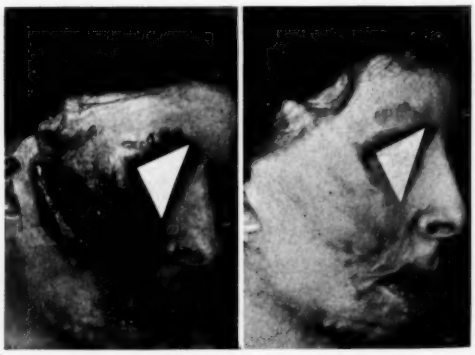

Fig. 2. *a*, Shows a whole thickness graft implanted in the cheek for the relief of an extensive contracted, thickened scar. Note the graft drawn under the undermined scar edges. Photograph taken 2 weeks after implantation. *b*, The same graft about 1 year later. Note the excellent condition of the graft, the amount of relaxation obtained, and the smoothness of the edges.

[1] From the Surgical Department of the Johns Hopkins University and Hospital.

surface, and the whole thickness graft is secured over the entire raw area. Obviously, this method cannot be used when the scar margins are thick and rigid.

Years ago, one of us brought forward the fact that, when a whole thickness graft healed successfully in the midst of an extensive scar, either in the gaping wound of a relaxation incision or after a partial excision, the tension of the scar was lessened, its stability was increased, and contracture was more or less relieved. Bearing this in mind and seeking for a method of obtaining greater relaxation from a whole thickness graft, we tried out a number of different schemes. Finally, we made use of the observation that where one layer of skin overlaps another, the tendency of the epithelium during the process of healing is to extend from both epithelial edges to cover the adjacent unepithelialized areas. The utilization of this fact gave the desired result.

TECHNIQUE

The method is simple and very easy of application. The contracted portion of the scar is either excised or incisions are made in such a way as to relieve the lines of tension most effectively. Then the entire margin of the defect, including the full depth of the scar, is undercut as far as necessary; usually for a distance of one-half centimeter to a centimeter and a half (Fig. 1). Measurements for the whole thickness graft are then taken, so that it will be large enough to cover the defect and the undercut area as well. The graft is then cut, freed of fat, and when hæmostasis is complete, it is sutured in position. This is done in such a manner that the edges of the graft are drawn under the undercut margins to the limit of the recess and are held snug by as many sutures as are necessary. The sutures are inserted at suitable intervals through the scar directly over the outer limit of the undercut area and are then passed through the margin of the graft and returned about one-half centimeter from the other limb of the stitch and tied. The result is a margin with an epithelial surface overlying the graft for the distance of the undercut. The wound is dressed with gauze impregnated with 3 per cent zeroform ointment over which a moist sterile sea sponge is placed under pressure, and secured by adhesive plaster and a bandage. The dressing is left in place for at least 2 weeks, unless in a situation where frequent change is indicated. At the end of that time, the sponge is removed and the sutures taken out. The subsequent treatment is that of any grafted area.

COMMENTS

The method is simple and most effective in situations where the scar tissue is too rigid to shift and where pedunculated flaps cannot be used. It is particularly satisfactory when dealing with extensive scars, but we have used it successfully in filling defects in normal skin.

The graft, itself, is immobilized and any desired tension may be secured. Its edges are protected from infection, which is an item of importance in certain areas such as around the mouth. By using the whole thickness graft in this manner, a larger graft can be used and the maximum ultimate relaxation can be gained for a given size of graft.

In the process of healing, epithelium from the edges of the graft and from the edges of the scar defect grow toward each other and finally meet, thus covering the under surface of the undercut margin. This, temporarily, results in an overlapping everted margin surrounding the graft, both sides of which are epithelialized. At first, this is somewhat unsightly, but in the course of a month or two, aided by massage and scar tension, this margin flattens out and becomes smooth. Thus, one gains a considerable distance beyond the edge of the grafted area, and in consequence, more relaxation (Fig. 2).

At first, we used molded dental compound for holding the graft flat under the undermined edges, but soon found that it was unnecessary. Fewer sutures are required to secure the graft properly, than when the usual technique is followed.

We have used this procedure for some time for the relief of scar contractures in various situations and have found it very satisfactory.

THE TREATMENT OF CARCINOMA OF THE PENIS WITH ENDOTHERMY WITH A METHOD OF TREATMENT OF METASTATIC MALIGNANT LYMPH GLANDS

Report of a Case

By HOWARD A. KELLY, M.D., F.A.C.S., and GRANT E. WARD, M.D., Baltimore, Maryland
From the Howard A. Kelly Hospital, Inc.

CARCINOMA of the penis in our experience seems to be a fairly common disease. It should be suspected by the general practitioner in every puzzling lesion of the penis he may see. Of the several methods of treatment—surgery, radium, X-ray, and endothermy (surgical diathermy) in most instances we prefer the latter and herewith briefly report a case.

Mr. C. H., age 65, entered the hospital on June 30, 1924, complaining of a sore on the penis. The family and past histories are unessential. The present illness began 2 years previously at which time the patient suffered with an open sore following an accident in which the penis had been injured. Examination revealed a vegetative growth on the left side of the organ just above the glans measuring 3 by 2.5 centimeters and 4 to 5 millimeters in elevation. The edges were rolled over and sharp. A large gland about 3 centimeters in diameter was found in the left groin, but none in the right. The abdomen was negative except for a postoperative hernia in an old appendix scar. General physical examination showed patient to be in good condition.

Operation. Under a general anæsthetic, nitrous oxide and ether, the local growth was thoroughly treated with bipolar endothermy (electrocoagulation—Clark) and curetted. The skin overlying the large gland in the left groin was incised with the endotherm knife (acusector) and the gland punctured and coagulated with a strong bipolar current. A piece of tissue was taken for diagnosis and the gland left *in situ* to be absorbed. The skin was closed over the coagulated gland with black silk suture and dry dressings applied.

Postoperative course and treatment. The patient made an uneventful recovery save for a little gaping of the skin edges of the groin incision and a serous discharge. The area on the penis was dressed daily with balsam of Peru ointment. Before leaving the hospital, the left groin was given a heavy outside distance radiation with radium. No radium or X-ray treatment was given the local lesion. He left the hospital a few days after the operation and has returned from time to time for examination during the past year with no sign of recurrence. Both the scars are soft and pliable. The accompanying photograph was taken 11 months after operation.

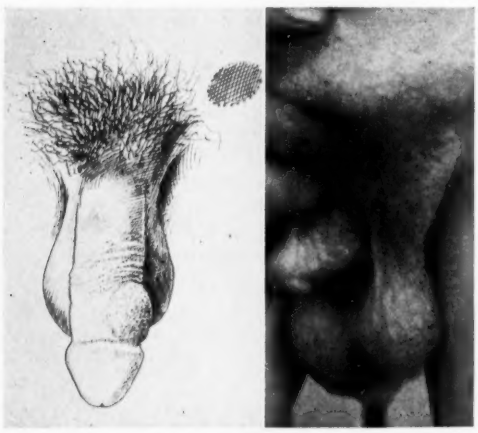

Fig. 1. Drawing of primary carcinoma of glans penis with enlarged gland in left groin before treatment.

Fig. 3. Photograph 11 months after treatment. The penal scar is soft and pliable, no induration in the groin.

DEDUCTIONS

1. With proper technique (coagulation) the local lesion in carcinoma of the penis can be cured with endothermy.

2. It is possible to eliminate a metastatic gland by incising the skin and exposing it and treating it with the strong bipolar coagulating current destroying the whole interior of the gland. This is an exceedingly important principle ca-

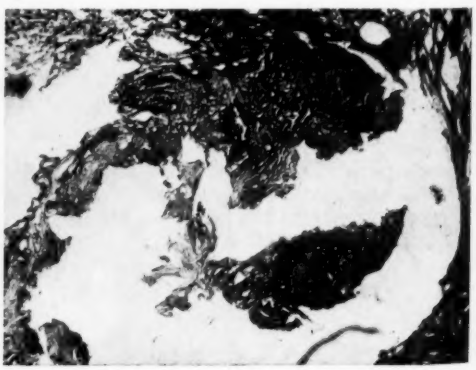

Fig. 2. Photomicrograph of tissue removed from the inguinal gland after coagulation with a strong bipolar current. Note the coagulation of the tumor cells into a mass of homogeneous material.

pable of a wide application in the treatment of lesions occurring in the abdomen, neck, and elsewhere in the body.

For example, in intra-abdominal malignancy with glandular metastases, it will be easy to insert the needle carrying a high frequency current and almost literally explode diseased glands out of existence, leaving the dead tissue to be absorbed *in situ*. This method of actually removing diseased lymphatic glands without long and tedious dissection with consequent danger to the patient is a tremendous adjunct to our surgical technique.

NOTE.—This work was done independently and without knowledge of the work of Corbus and O'Conor:

CORBUS, B. C. A case of prickle-cell carcinoma of the penis treated by diathermy and radium. Am. J. Clin. Med., 1921, April.

CORBUS, B. C., and O'CONOR, V. J. Diathermy in the Treatment of Genito-Urinary Diseases with Especial Reference to Cancer. Bruce Publishing Co., 1925.

EFFICIENT SUPRAPUBIC SUCTION DRAINAGE

BY HAROLD H. GILE, M.D., BOSTON

From the Urological Clinic of the Peter Bent Brigham Hospital, Boston, Massachusetts

SUCTION drainage has of late years become an increasingly important factor in many phases of surgery. It would seem to be especially adapted to operations upon the urinary bladder and yet there has been relatively little use made of it in this field.

For many years various forms of suction have been tried in an effort to keep prostatic patients dry after suprapubic operations, but apparently none have met with general approval. In fact the idea of using suction following suprapubic cystotomy has been in disfavor among the majority of genito-urinary surgeons. Their reasons against its being used are: (1) that it may cause bleeding; (2) that it requires too much attention; (3) that they have never seen it work satisfactorily; (4) that most suprapubic wounds heal all right anyway, if left alone, regardless of urinary drainage.

None of the above arguments, or any other which I have heard, seems sufficient to discountenance the use of suction drainage in these conditions, if it can be successfully and easily accomplished.

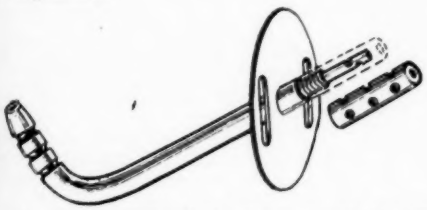

Fig. 1. Shows suction device drawn actual size. The fenestrated protection collar is unscrewed from tip of sucker. The material of which the apparatus is made is aluminum.

Without any doubt, the most disagreeable feature in the postoperative course of patients who have undergone operations upon the bladder, is the drainage of urine which keeps them wet until the tract has healed. Not only is this condition unpleasant for the patient, but also time-consuming for the nurses who must care

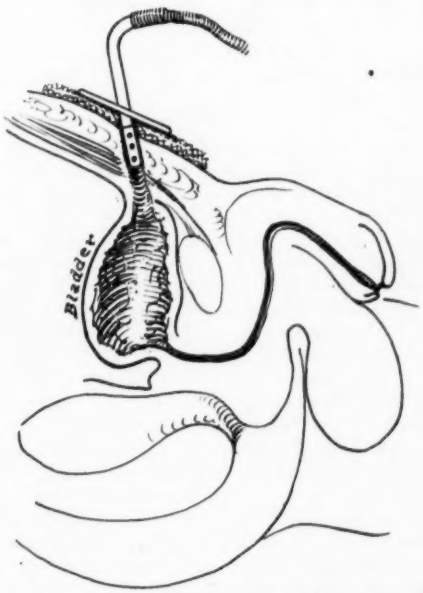

Fig. 2. Sagittal section showing suction apparatus in position. There is a flat piece of gauze between the flange of sucker and the skin. Note that position of this device in no way interferes with closure of bladder wound.

for him. For this reason the prostatic is never a popular admission with the nurses or house staff of any hospital. Quantities of gauze dressings and the almost constant attention of a special nurse are essential to keep such a patient even partially dry. Furthermore, despite the fact that most suprapubic wounds do eventually heal, even though but little care is taken of them, it is far from ideal to have a constant flow of urine over a wound which we are attempting to heal. This is especially undesirable during the first post-operative days when the wound is recent and more liable to infection, for in the majority of cases of prostatic obstruction, the urine is already infected before operation.

In an effort to obviate this postoperative "wetness" several schemes have been followed.

1. Special types of dressing have been devised such as one in which the sinus tract is surrounded with a circle of heavy ointment, over which is placed an oil silk or rubber dressing with an opening in it which is superimposed over the sinus tract and surrounding ointment. This waterproof material contains gauze and is folded in such a way that if the dressing does not slip, the urine enters the interior of this contrivance and is absorbed by the contained gauze. At best this can be used successfully only by a nurse who can give an undue amount of her time to it.

2. After removal of the suprapubic tube left at operation, increasingly smaller sized tubes have been substituted as time goes on. A certain amount of urine may drain this way, but there is nearly always some leakage.

3. Mushroom catheters have been substituted for the suprapubic tube after its removal. These are efficient in draining the larger part of the urine, but there is usually some leakage and, furthermore, the retention of this mushroom catheter necessitates the continuance of an opening in the bladder wall.

4. After the fourth or fifth postoperative day some surgeons make a practice of placing the patient on constant urethral drainage. This undoubtedly hastens the closure of the suprapubic wound by diverting the urinary stream, but it does not keep the patient entirely dry and does not solve the problem of wetness for the first few days when the wound is most recent and most likely to become infected from the contaminated urine. It is also doubtful whether it is wise to place a foreign body such as a catheter in such intimate contact with a prostatic bed not yet healed. Again the very real danger of a purulent urethritis and the possibility of epididymitis must be considered if this method be employed.

5. Many different forms of suction apparatus have been devised and reported but none has enjoyed general use.

a. G. Heaton, in 1898, made use of a siphon arrangement which had been employed by dentists in England at that time. He pointed out the necessity of having an outer fenestrated portion around any suction tube, to protect the tissue from being drawn up by the vacuum.

b. Kenyon and Poole, in 1913, described similar suction tubes used by them in aspiration of many types of wounds. They obtained power from the water suction pump.

c. Chetwood, in 1914, obtained good results with an arrangement entirely like the one we are now using, except for the suction tube itself. He used a small rubber tube inside a larger fenestrated one. In addition, he employed a needle valve between the vacuum pump and the bottle to reduce suction. He describes one case in which hæmorrhage was started from excessive suction. He left the tube in the bladder for 10 days, after which he removed it and collected the urine from then on in a bell-shaped glass cover strapped over the sinus.

d. Davis, in 1916, used a vacuum bottle arrangement.

e. Bethune, in 1918, brought out an apparatus consisting of two opposed 2 gallon carboys. Suction is caused by the water in one bottle dripping through connecting glass tubes to the opposite bottle. When the top bottle is empty the frame is turned so that the full bottle is again on top and the process continues. With this he uses a small catheter inserted into the bladder, which is removed when the sinus tract has closed sufficiently to hug the catheter tightly. This apparatus met with considerable favor and has been used to some extent in many hospitals. The objections to it are that it is not uncomplicated, that it does not have sufficient power, and that it is difficult to find an interne or nurse who is enough interested to spend the necessary time and effort to keep it functioning.

Feeling that suction drainage had never been given a fair trial in the solution of this problem, I devised a small instrument consisting of a suction tube with a whistle tip, outside of which is a perforated guard which prevents any surrounding tissue from being drawn in to clog the suction opening. The suction end fits into the sinus tract and the other end fits into a rubber tube which takes the urine into a bottle beside the patient's bed. There is a flange, offset from the horizontal, in such a way as to fit the typical obliquely directed sinus tract. The power for the suction is

TABLE I.—LONG SUCKER USED

Case Number	Type of hypertrophy	Urethral catheter used	Days suction used	Day dry postoperative
22764	General	Yes	2nd–7th	12th
22704	General	No	3rd–9th	19th
23760	General	No	3rd–8th	13th
23113	Median	No	2nd–7th	8th
23562	General	Yes	2nd–8th	19th

TABLE II.—SHORT SUCKER USED

Case number	Type of hypertrophy	Urethral catheter used	Days suction used	Day dry postoperative
24120	General	No	1st–13th	13th
24206	General	No	1st–10th	13th
24175	General	No	1st– 9th	15th
24438	General	No	1st–13th	16th
24749	Median	No	1st–10th	11th
24055	General	No	1st– 8th	10th

obtained from the water faucet; though motor power, as obtained with the Connell etherizing apparatus, would be as satisfactory (Fig. 1).

At first a long shaft on the sucker was employed so that it might take a position within the bladder cavity. This arrangement functioned perfectly well, but had the same objection as the mushroom catheter in that it maintained an opening into the bladder. After 7 or 8 days the sucker was removed and the patient was placed on constant urethral drainage. This program was effectual in that it kept the patient dry at all times and with it the operative wounds remained perfectly clean. However, the method did necessitate a catheter in the urethra for several days, which is certainly not to be desired.

Later I could see no advantage in having the sucker extended into the bladder cavity. In fact it seemed more in accord with good surgical principles that the superficial portion of a drained wound should be kept open until the deeper parts had closed. Consequently I had a short sucker made which penetrated not more than 5 centimeters below the skin surface. This has worked ideally on the few cases already tried. This method allows the bladder wall to close completely while the suction continues to keep the patient dry. The result is that the bladder wound heals more quickly and urethral drainage is entirely unnecessary. It is also fortunate that this apparatus works as efficiently with the patient sitting in a chair as it does with the patient lying in bed. Also, it is quite simple to detach the rubber tube from the suction device, leaving the latter in place, to allow the patient to take short walks, reconnecting the tube and sucker on returning to the bed or the chair (Fig. 2).

Convincing proofs of the efficiency of this procedure are: (1) the patient's satisfaction; (2) the nurses' enthusiasm about it as compared with former methods; (3) the rapid convalescence and attainment of the "dry condition"; (4) the absence of an infected wound in any case so far; (5) the ability to make an accurate collection of the urinary output.

This suction arrangement has been used on the following cases. On the first group the long sucker was used (Table I). All these were one-stage prostatectomies.

On the next group the short sucker was used (Table II). The first five were one-stage operations, the last was a two-stage type.

The short sucker has proved very much superior to the long one and is now used exclusively. No case yet has become wet again after once becoming dry. There has been no instance of hæmorrhage being caused. Indeed, this is hardly a possibility when one considers that the suction device does not extend even to the bladder itself. In none of these cases has the urethral catheter been necessary.

CONCLUSIONS

The advantages to be gained from the use of efficient suprapubic suction drainage are:

1. The patient is dry after first 24 hours following operation.
2. It eliminates frequent dressings.
3. The wound is kept free of urinary drainage and postoperative wound and bladder infection is apparently reduced.
4. It allows early closure of the vesical wound.
5. It requires a minimum amount of attention.
6. Complete healing occurs earlier.
7. The patient's stay in the hospital is materially shortened.

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A METHOD OF PASSING A WAX TIPPED CATHETER THROUGH THE CYSTOSCOPE WITHOUT MAKING A SCRATCH

By R. S. MALLARD, A.B., M.D., Fort Worth, Texas

KNOWING the difficulty sometimes in differentiating a scratch made by an instrument from one caused by a stone on a wax tipped catheter I have attempted to obviate this difficulty by passing the wax tipped catheter through the cystoscope, protecting the tip of the catheter by the finger tip of a rubber glove. I do not know whether or not this method has been used before. If it has I would appreciate some one sending me the reference. The method is very simple and practical. I have tried it with the cystoscope inside and outside of the bladder and after passing the experimental stage have not had any difficulty.

The cystoscope is introduced in the usual way and the obturator is removed. The wax tipped catheter is covered by a finger tip cut from a new rubber glove. The finger tip is attached to a coarse type of sewing thread, the thread transfixing the apex of the finger tip and tied in a large loop passed through its most convex portion. When the finger tip is in place over the waxed end of the catheter, the catheter is gently pushed through the cystoscopic sheath well into the bladder. No attempt is made to fasten the finger tip to the catheter. A little difficulty is encountered in getting the end of the catheter through the fenestra of the sheath, but a little gentle manipulation will overcome this. After the catheter is inserted well into the bladder, the finger tip will fall off or will be washed off by the inflowing stream of water, and will float about attached to the thread. By means of this thread the shield can be immediately withdrawn from the bladder through the cystoscopic sheath. This should be done very gently as the thread is likely to cut through the rubber and leave the finger tip in the bladder; traction on the thread should be gentle and steady. If the finger tip should become detached, the mishap should not be a serious one if one has a cystoscopic forceps at hand.

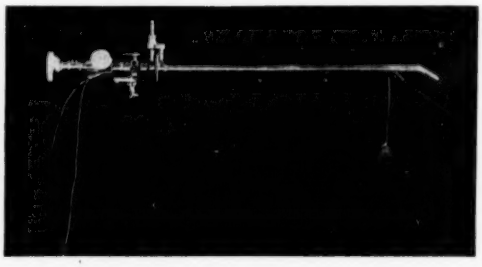

Fig. 1. Cystoscope showing rubber glove finger tip attached to thread.

In experimenting with this method I passed a wax tipped catheter through the sheath of a Brown-Buerger cystoscope twenty-one times consecutively and through a McCarthy cystoscope twelve times without making a scratch. I probably could have passed it many more times with the same result. During these thirty-three trials the finger tip pulled off the thread once, and this could have been avoided by using less traction and a little more time.

The advantage of this method is that it eliminates the pain, difficulty, and trauma, of passing the cystoscope through the urethra over a wax tipped catheter as described by Goldstein, of Baltimore.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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MAY, 1926

CHRONIC APPENDICITIS

MANY members of the medical profession question the existence of chronic appendicitis which has not had its origin in acute appendicitis. However, chronic appendicitis may exist without clinical evidence or previous history of an acute attack. There are at least two well-defined types of chronic appendicitis.

In the first type, the appendix contains fæcal concretions, often of considerable size, and sometimes to the touch like a string of beads. Occasionally one sees a case of unexplained hæmorrhage from the stomach in which finally an exploratory operation reveals no other cause than such an appendix. Following removal of the appendix the patient has no more hæmorrhages, gains greatly in weight, and apparently gets well. One may assume that this recovery is a coincidence, and not a consequence of the appendectomy, but certain careful observers believe that a chronic infection which is carried to the liver from the appendix is responsible for the hæmorrhagic erosions of the mucous membrane of the stomach, which are sometimes found in these cases. The French have written interesting contributions on this condition.

In the second type, one explores for a perplexing epigastric condition, does not find lesions in the upper abdomen, but brings to light a markedly diseased appendix buried in a mat of adhesions, when there has been nothing in the clinical history to indicate that the patient ever had an acute attack of appendicitis. An appendix of this type is often seen in conjunction with cholecystitis without stones. Moynihan suggests that possibly such an appendix may be related, etiologically, to duodenal ulcer. These two varieties of appendicitis, unless there is retention of secretions or local peritonitis, do not give rise to pain in the right iliac fossa, but painful sensations are referred to the epigastric region and are recognized clinically in a considerable group of cases as appendiceal dyspepsia from the associated pyloric spasm.

The reticulo-endothelial tissues represented, among other organs, by the spleen, the lymph-nodes, and the tonsils, reach their height of development during the adolescent period, and from then on undergo gradual loss of function. So true is this that in a very high percentage of the spleens of persons in middle and later life the pulp cells have disappeared to a large extent and have been replaced by fibrous tissue. Thirty years ago, it was pointed out by Charles H. Mayo that the progressive age atrophy of the lymphatic tissues of the body undoubtedly accounted for the relatively slower progress of cancer in the old than in the young, because of the greatly lessened amount and activity of the lymphatic tissues. Often a young person has

very large tonsils, which later in life become so reduced in size that they can scarcely be identified.

The appendix contains lymphoid tissue of the same general character as that in the tonsils, and undergoes the same trophic changes. Ribbert demonstrated the incidence of involution in the appendix and asserted that in persons under 25 years of age, 25 per cent of appendices show the changes of involution. Between the ages of 25 and 50, 50 per cent of persons show these changes, and between the ages of 50 and 75, nearly 75 per cent show chronic involution. These changes begin in the tip of the appendix and extend to the base. Much friable fat is often present in the meso-appendix. The process when complete was at one time called appendicitis obliterans. An appendix of this character cannot be considered pathological.

The autonomic nervous system of Langley, formed by Gaskell's nerves from the anterior horns of the spinal cord to the great sympathetic ganglia, with the vagus and the pelvic nerve, forms the great thoracic and abdominal nerve plexuses, and gives the appendix its nerve supply. We have learned only recently that these nerve fibers are also nerves of sensation, in chronic disease conditions of the appendix distressing sensations being referred to the epigastric region, there being no pain or tenderness on palpation of the right iliac fossa, with which region there are no direct nerve connections.

Mistakes in diagnosis are made because of overemphasis of the possibility that pressure on a chronically diseased appendix, without localized peritonitis and retained secretions, causes pain at the so-called McBurney's point.

The neurasthenic patient, whose attention has been focused on the right iliac fossa, a region which has been subjected to repeated, sometimes rather painful, manipulations to elicit tenderness, is operated on for the removal of an appendix undergoing normal involution, and the operation, the failing to give the relief expected by the patient, unless from suggestion, is humiliating and disappointing to the surgeon.

The misinterpretation of the changes in the appendix as a result of involution which have been miscalled chronic appendicitis has probably led to most of the difficulty in cases of what has flippantly been called "right-siditis."

W. J. MAYO.

ACUTE OSTEOMYELITIS

IT is the common experience of clinicians in all large clinics, both for adults and children, to find that very rarely is the diagnosis of acute appendicitis overlooked. With a correct diagnosis, efficient treatment is instituted early. As a consequence, almost in one generation, the mortality from this condition has been reduced to a minimum, the suffering enormously diminished, and the economic loss from a long and wasting convalescence correspondingly lessened. The general practitioners in all sections are wide awake to the signs and symptoms of this condition and the necessity of an early diagnosis.

On the other hand it is an equally common experience, especially in the large children's clinics, to find that an early diagnosis of acute osteomyelitis is rarely made, and in every such clinic are found large numbers of cases with extensive and destructive inflammations of bone which must result in long and tedious courses of treatment, with the probability of recurring attacks of infection over a period of many years, if not throughout a whole lifetime. It is with the hope of stimulating a new interest in this important subject that the writer takes advantage of this opportunity to place before the readers

of SURGERY, GYNECOLOGY AND OBSTETRICS, some facts gleaned from a fairly large experience.

A correct diagnosis of osteomyelitis is not difficult in the vast majority of cases if practitioners and consultants are alert to the possibilities of its occurrence. The history of the case is most important. The disease is pre-eminently a disease of childhood and rarely occurs after the epiphyses are completely fused with the shaft of the bone. The infection is blood borne, and is either staphylococcic or streptococcic in type, the staphylococcic infection being the more common and, in this instance, the more virulent. The source of the primary infection in the case of the streptococcus is the mouth cavity, including the tonsils and sinuses or middle ear, while in the case of the staphylococcus it usually arises from the skin surface, as a boil or infected abrasion. An infected abrasion of the heel is very common. The history carefully worked up shows that a child, apparently perfectly well, develops a sore throat or has a local skin infection, and possibly receives some injury which may be sufficient to wrench or twist one of the epiphyses. It is capable of demonstration that such traumatism may cause minute hæmorrhages in the region of the metaphysis, making a good culture medium for organisms, and at the same time lowering the resistance of this part to any infection. A few days subsequently pain and tenderness develop in the *neighborhood* of a joint and this is accompanied by signs of general infection, namely: fever often to 103 or 104 degrees F., rapid pulse, dry tongue, and a definite leucocytosis.

A careful and patient examination is the next essential. It will be noted that at this early stage no signs of joint change are found. That is, there is no fluid in the joint, no swelling of any kind, and by careful examination passive movements of the joint may be elicited freely and without pain. This should exclude septic arthritis and acute rheumatic fever with joint manifestations. It is also possible of demonstration that the pain is adjacent to the joint but not in it. The tenderness will be marked about the epiphyseal level and usually more definite on one side than on the other. This gives the best clue to the point of incision for early treatment. In the case of infection of the upper end of the femur where the upper epiphysis lies within the capsule of the joint, the osteomyelitis will almost always be accompanied by a septic arthritis of this joint as well, and probably all cases of acute epiphysitis in the upper end of the femur in infants, are primarily cases of acute osteomyelitis. The X-ray findings are always negative in this early stage.

The diagnosis being thus early established, prompt treatment should result in clearing up the infection without sequestration or fear of subsequent recurrence. A word as to the pathology will aid in the determination of the correct line of treatment. Early autopsy investigation of cases dying of acute general septicæmia with local osteomyelitis, a careful study of X-ray findings, and experimental studies in animals, have clearly established the fact that the infection is carried to the minute capillaries in the diaphyseal end of a long bone from a local focus, and that it spreads from that point. It has also been demonstrated that, contrary to earlier teaching, the infection spreads most readily along the epiphyseal line to the cortex. If it is remembered that the cortex at the epiphysis is so thin as to be scarcely recognized as compact bone, it is easy to understand that no barrier is met here to prevent spread to the periosteum. The periosteum, being closely attached to the epiphysis beyond the

epiphyseal line, prevents the spread of infection to the joint; the stripping of this membrane from the shaft is away from the joint.

If this pathological picture is correct, then the obvious treatment as soon as the case is diagnosed is adequately to drain the infected area of bone and thus prevent the spread of the infection, and prevent also the wide spread stripping of the periosteum from the shaft. Over the point of maximum tenderness, and on the diaphyseal side of the epiphyseal line, an incision should be made through the periosteum to the bone. If no frank pus is encountered, and only some œdema of the soft tisses found, the periosteum may be stripped for a short distance with a blunt periosteal elevator. Then a small window may be cut out of the cortex, or a series of two or three drill holes made obliquely into the cancellous bone, toward but not reaching the epiphyseal line. Culture of the bone dust removed will show infective organisms even if no free pus is discovered. In the course of 24 hours frank pus is usually present, coming from the drainage tube.

No further operative interference is called for or is even justified, in this early stage, and least of all is it wise to open the medullary cavity either by trephine or chisel. The desired result in this early stage is to drain an infected area of bone before the blood supply is cut off by inflammatory blocking of the blood vessels and thus head off necrosis and sequestration of bone. This has been accomplished in a gradually increasing number of cases and can be still further extended with the co-operation of a greater number of interested practitioners.

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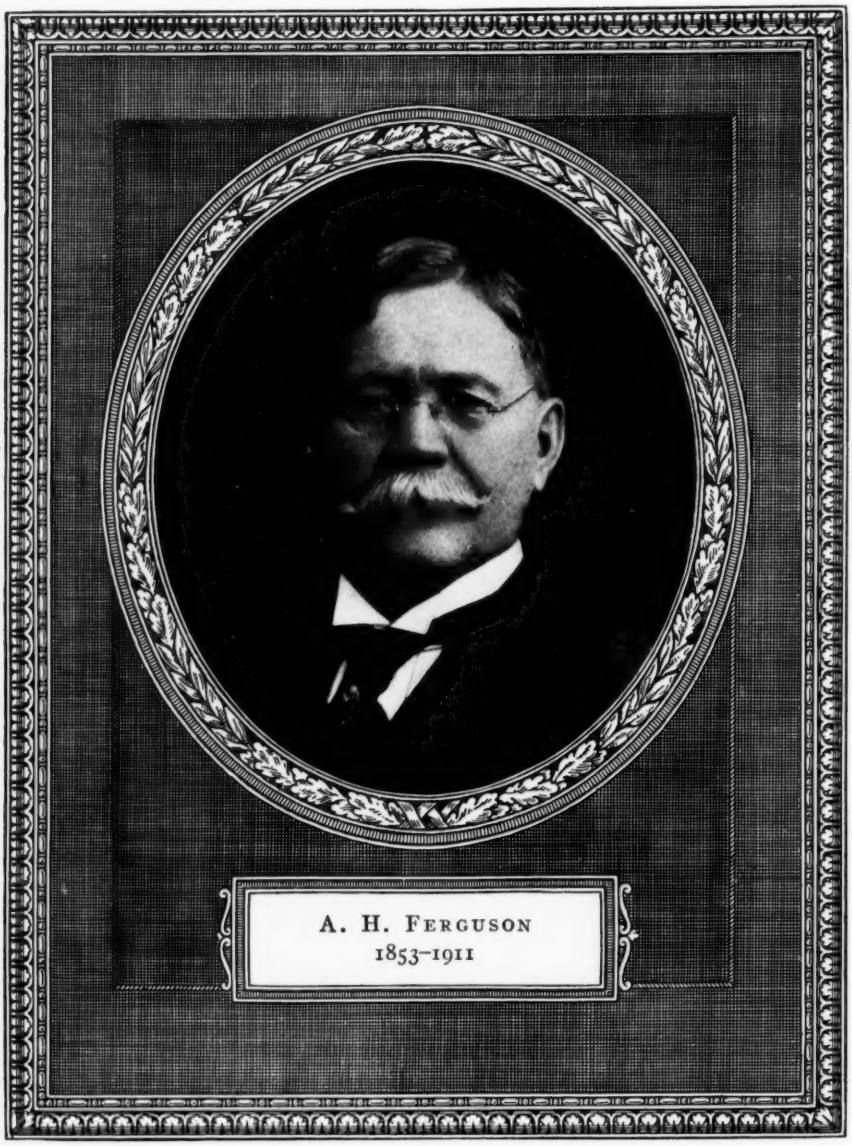

A. H. Ferguson
1853–1911

MASTER SURGEONS OF AMERICA

ALEXANDER HUGH FERGUSON

ONE of those who reached the highest rank among American surgeons was the late Alexander Hugh Ferguson of Chicago. A Canadian by birth, of Scottish parentage, and a direct descendant of a line of Covenanters, he gradually rose from the obscurity of a rural home to become one of the outstanding figures among the surgeons of America.

He was born near the village of Woodville in the Province of Ontario, on the 27th of February, 1853. Of strong vitality and a clear mind, he possessed the rare qualities of persistency, perseverance, and a great capacity for work, which eventually overcame all obstacles, and carried him to great achievements. His education was of that practical quality of the Ontario Rural Schools which served him so well in after life, himself becoming a teacher, and later a tutor of Latin at the Rockwood Academy. The lure of the West attracted his parents to Manitoba, and they settled in Winnipeg, where he studied at the Manitoba Presbyterian College. He continued his studies at Toronto University and Trinity Medical School, where he graduated, a Bachelor of Medicine in 1881, and the same year, an Honorary Graduate M.D., C.M., later taking advanced training in New York, Glasgow, London, and Berlin. From the University of Berlin, he attained a special certificate in bacteriology.

Returning to Winnipeg, he began the practice of his profession in 1882. In 1883, he with twelve others, outstanding men even in those early days of the country's development, founded the Manitoba Medical College, which has since become affiliated with the University of Manitoba, one of the leading universities of Canada. Associated with Dr. Ferguson in founding the Manitoba Medical College and justly entitled to the distinction of being the pioneers in medical education in Western Canada, were: Doctors James Kerr (deceased); James Robert Jones (deceased); Robert Johnston Blanchard, Winnipeg; Robert George Brett, Edmonton; Robert Buchanan Ferguson (deceased); James Wilford Good, Vancouver; James William Whiteford (deceased); James Patterson (deceased); Theogene Fafard (deceased); Andrew McDiarmid, Pocahontas; Hon. David Henry Wilson (deceased); William Robert Douglas Sutherland (deceased). These men possessed a wonderful vision and some of them lived to see the realization of their dreams in bricks and mortar, a Grade A medical school.

In 1886, Dr. Ferguson accepted the professorship of surgery in the Manitoba Medical College, following the late James Kerr, who resigned to accept a similar chair in Columbia University, Washington, District of Columbia. He was a member of the staffs of the Winnipeg General and St. Boniface hospitals. On December 18, 1893, the chair of surgery in the Post Graduate Medical School and Hospital of Chicago was offered him, which, after due consideration, he accepted and assumed his duties in June, 1894.

The esteem in which he was held by his professional brethren in Canada is reflected in an illuminated address presented by the Faculty of the Manitoba Medical College upon his departure:

"As Professor of Surgery, you have not only commanded the admiration and regard of your Associate Professors, but also the veneration and loyal esteem of your students. Your operative work in Hospital and Private practice has challenged the keenest attention of the Medical Profession of this country, and has reflected the highest honor on yourself and credit upon the Medical Profession of Canada, etc."

In time, he became owner and chief surgeon of the Chicago Hospital, one of the most efficiently equipped institutions in the West at that time. In 1900, Dr. Ferguson accepted the chair of professor of clinical surgery in the College of Physicians and Surgeons (University of Illinois, College of Medicine), one of the most progressive colleges in America.

Dr. Ferguson's fame as a teacher of surgery and as a skilful operator extended beyond the shores of America, and some years before his death, King Carlos of Portugal honored him with a decoration of which he was justly proud: "The Commander of the Order of Christ" for "excelling in surgery." Being diligent he did stand before kings.

Intuitively he seemed to possess the power to apply means to ends. Thus, he devised many surgical instruments that bear his name: the Ferguson artery forceps, Ferguson pedicle clamp, a prostatic retractor for the operation of perineal prostatectomy, and other instruments. He developed and improved the operation for cleft palate, excision of the maxilla for malignant disease, and devised an ingenious operation for drainage of the subarachnoid space into the peritoneal cavity by tunnelling through the body of the fifth lumbar vertebra and inserting a silver wire seton. Although not a voluminous writer, he contributed a number of excellent articles on surgical topics and wrote a monograph on hernia, which is a classic on this subject. The operation for inguinal hernia with which his name is associated is at many clinics the most popular today.

Dr. Ferguson was a member of the following medical societies and was one of the outstanding figures at their gatherings: The British Medical Association; the American Medical Association; International Surgical Congress; Chicago Medical Society (ex-president, 1910); Michigan State Medical Association (Hon.);

Chicago Gynecological Society; Chicago Surgical Society; Fellow, American Surgical Association; Chicago Academy of Medicine; American Association of Gynecologists and Obstetricians; Southern Surgical and Gynecological Association; Western Surgical and Gynecological Association (ex-president).

Among an ever increasing circle of friends and admirers, Dr. Ferguson's loyalty and devotion to those of his early days never waned. He possessed in a large measure that quality which is known by the Scots as "clannish." His door, 4619 Grand Boulevard, was ever open to his old friends, especially those from Canada. He was a member of the Scottish Rite, a thirty-second degree Mason (A.F. & A.M.), and a member of the Presbyterian Church.

After a brief illness, he passed away on October 20, 1911, being survived by Mrs.Ferguson who is a daughter of the late Mr. Edward Thomas, Esq., of Nassagawaya, Ontario; and two sons, Mr. Ivan Havelock Ferguson, and Alexander Donald Ferguson, M.D., of Chicago.

Dr. Ferguson contributed his quota to the advancement of the science of surgery. As a leader in the surgical thought of his day, he ranked with Fenger, Senn, and Murphy. His was a life worthy of emulation. · NEIL JOHN MACLEAN.

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED BROWN, M.D., F.A.C.S., Omaha, Nebraska

THE SURGERY OF ROLAND OF PARMA

ROLAND of Parma was an Italian surgeon who achieved great prominence during the 13th century. Some of this reputation was due to reflected glory from his master and predecessor, the great Roger, upon whose work his writings are based, some of them being copies word for word. Roland was born at Parma and spent part of his life there and part in Bologna, where he was a teacher in the great school. So far as is known he did not travel, but as the Arabian surgery had already been brought to Italy he was able to study the translations made by Constantinus Africanus and add the teaching of the Arabian school to that of the Italian. His work attained great reputation in the middle ages, and was included in the Codex from which the lectures at the School of Salerno were given. It was called by a special name "Rolandina." The work of course existed only in manuscript form for many years and was first printed in 1499 as a part of the Venetian collection of Surgery (*Collectio chirurgica Veneta*). It was also included in the commentaries of the four masters in the *Collectio Salernitana*. It was subsequently reprinted under the title *Humani Corporis, interiorum et exteriorum, morbis medendi ratio methodica, autore Rolando*, by Henricus Petrus at Basle in 1541.[1]

Looking over these old books brings up an interesting point with reference to the development of surgery. It is the synchronism between that part of surgery which at the time commanded the greatest amount of attention and the development in the art of making war. At first glance this may seem peculiar and far fetched, but more careful observation establishes certain phases in surgical procedure which go hand in hand with the forms and methods of warfare. When we examine a book on surgery of the time of Roland we find the subject which receives the greatest amount of attention to be fractures of the skull and wounds of the head. This portion of surgery has reached a high standard when compared with others. This remains true for some years, and why?

Turning for a moment to the times we realize that it was a period immediately following the age of chivalry. Then knights in full armor carried on [illegible]. The weapons were the lance, the mace, and the battle axe, and the methods were those of the tournament and joust. The warriors were almost all mounted and the head was the part aimed at. Consequently, the majority of casualties were head injuries, contusions, concussions, and fractures. This type of trauma therefore made up a large part of the practice of the surgeon of the time and naturally this fact was reflected in his writings. A little later the subject that we find assuming major proportions is of wounds caused by darts and arrows, and history tells us of the improvement of the short bow of Hastings into the famous long-bow with its tremendous power for shooting arrows. Next in order is the invention of the harquebusse with its use of gunpowder and bullets, and the works of the surgeons of the sixteenth century take up the surgical problems arising because of wounds of this character: methods of probing for bullets; the invention of forceps for their removal; the ligation of injured vessels; and others. Surgery and warfare therefore proceed hand in hand even to and including modern times. It is necessary only to turn back to the literature of eight or nine years ago and read of the terrific compound comminuted fractures on the one hand and gas poisoning on the other to realize that there had been changes in the art of warfare.

So we find that Roland devotes his first book to the surgery of the head, in which he includes mania, melancholia, epilepsy, and diseases and injuries of the eye and nose. His knowledge of the important clinical signs in head injuries is considerable and his differentiation from a prognostic standpoint is keen, though of course his physiological basis is not particularly sound. Thus in his first paragraph he states that fracture of the skull may occur either with or without a wound of the scalp; that the wound if present may be large or small; but in any event the important thing is neither the wound nor the fracture but whether or not the coverings or substance of the brain are injured. He differentiates between lesions of the dura and pia mater. In injury to the dura he states that there is pain in the head, redness of the face, inflammation of the eyes, wandering of the mind, and blackness of the tongue. When the pia is injured, however, there are loss of consciousness, loss of voice, pustules on the face, blood and serum flowing from nose and ears, constipation, and when the injury is severe, a rigor of the body which is a certain sign of death. The work is interesting, and in itself shows why Roland was considered a master in his time.

[1] Reviewed through the courtesy of the John Crerar Library, Chicago.

& cum inſtrumento ſeparetur craneum undique circa plicaturam,

& cum terebello perforetur,

& totum craneum remoueatur. Reliqua de fractura cranei prædiximus.

De tineis cum euulſione capillorum curabilium, & incurabilium,
Caput XXVI.

TInearum alia curabilis, alia incurabilis. Incurabilis his ſignis cognoſcitur, cutis eſt denſa & dura, ſquamas multas emittit, pilos corrodit, huius curam relinquimus. Eius uero quæ eſt curabilis duæ ſunt medicinæ. Vna pilos multos educit, & quoſdam ualde groſſos, & cutis eſt groſſa tum continua non dura. Altera, non habet groſſam cutem & ſciſſam, non multo pruritu, & aliquando emittit ſaniem, ſed in quacunq; iſtarum ſit cum hac cura medemur capillorum euulſionem.

Cura.

REcipe emplaſtri albi, picis nauális aā. unc. 1. nucum communium uncias ſex, hæc terantur & in ſimul incorporentur bene ad modum ungenti, quod ſi fuerit opus in hyeme, extrahatur oleum ex ipſis nucibus,

& ipſo

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED BROWN, M.D., F.A.C.S., Omaha, Nebraska

THE SURGERY OF ROLAND OF PARMA

ROLAND of Parma was an Italian surgeon who achieved great prominence during the 13th century. Some of this reputation was due to reflected glory from his master and predecessor, the great Roger, upon whose work his writings are based, some of them being copies word for word. Roland was born at Parma and spent part of his life there and part in Bologna, where he was a teacher in the great school. So far as is known he did not travel, but as the Arabian surgery had already been brought to Italy he was able to study the translations made by Constantinus Africanus and add the teaching of the Arabian school to that of the Italian. His work attained great reputation in the middle ages, and was included in the Codex from which the lectures at the School of Salerno were given. It was called by a special name "Rolandina." The work of course existed only in manuscript form for many years and was first printed in 1499 as a part of the Venetian collection of Surgery (*Collectio chirurgica Veneta*). It was also included in the commentaries of the four masters in the *Collectio Salernitana.* It was subsequently reprinted under the title *Humani Corporis, interiorum et exteriorum, morbis medendi ratio methodica, autore Rolando,* by Henricus Petrus at Basle in 1541.[1]

Looking over these old books brings up an interesting point with reference to the development of surgery. It is the synchronism between that part of surgery which at the time commanded the greatest amount of attention and the development in the art of making war. At first glance this may seem peculiar and far fetched, but more careful observation establishes certain phases in surgical procedure which go hand in hand with the forms and methods of warfare. When we examine a book on surgery of the time of Roland we find the subject which receives the greatest amount of attention to be fractures of the skull and wounds of the head. This portion of surgery has reached a high standard when compared with others. This remains true for some years, and why?

Turning for a moment to the times we realize that this was a period immediately following the age of chivalry. Then knights in full armor carried on war. The weapons were the lance, the mace, and the battle axe, and the methods were those of the tournament and joust. The warriors were almost all mounted and the head was the part aimed at. Consequently, the majority of casualties were head injuries, contusions, concussions, and fractures. This type of trauma therefore made up a large part of the practice of the surgeon of the time and naturally this fact was reflected in his writings. A little later the subject that we find assuming major proportions is of wounds caused by darts and arrows, and history tells us of the improvement of the short bow of Hastings into the famous long-bow with its tremendous power for shooting arrows. Next in order is the invention of the harquebusse with its use of gunpowder and bullets, and the works of the surgeons of the sixteenth century take up the surgical problems arising because of wounds of this character: methods of probing for bullets; the invention of forceps for their removal; the ligation of injured vessels; and others. Surgery and warfare therefore proceed hand in hand even to and including modern times. It is necessary only to turn back to the literature of eight or nine years ago and read of the terrific compound comminuted fractures on the one hand and gas poisoning on the other to realize that there had been changes in the art of warfare.

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& ipſo

UNIV. OF MICH.

REVIEWS OF NEW BOOKS IN SURGERY

FREQUENTLY the medical society is favored with a paper on the "Acute Abdomen." This will no longer be necessary for within the reach of every medical student and general practitioner lies Cope's neat monograph[1] of just over 200 pages dealing with this subject of early diagnosis quite completely.

In an orderly and easy style, the author discusses the principles of diagnosis in acute abdominal disease, the method of diagnosis including history taking and examination. Then follows, in order, the common causes of acute abdominal disease starting with appendicitis and giving a differential diagnosis.

With only one statement do we disagree. In these United States we find that in a majority of instances the intestinal obstruction follows a previous operation, usually on a woman, a finding at variance evidently with that in England where the author resides.

KELLOGG SPEED.

PATHOLOGY is the foundation of Kopetzky's excellent volume.[2] Symptoms and findings are closely correlated with the underlying disease processes, and specific surgical relief advised for the specific condition. The author defines more carefully than usual the different types of disease and attempts to define the procedure for each situation. This effort to particularize, to work out the exact pathology with its special operative relief, is one of the very good features of the book.

The work is well done, thorough, very informative, with adequate anatomical description and full details of surgical technique, usually supplemented by clear illustrations. All of the standard methods are described with good discussion of the relative merits of each. Controversial points are for the most part judicially considered with fair citations from the literature; and the author supports his position from his own large experience with many case reports.

Some of his ideas may be considered revolutionary, as for instance his conception of "hæmorrhagic (septic) mastoiditis" as a condition requiring intervention almost at the onset of the initial otitis. His ideas have, at least, had a considerable influence in emphasizing the danger of too complacent delay in such cases. Although some authorities may not be so ready as he to intervene, it must be admitted he has made a good attempt to rationalize the indications for the time and type of operation.

Some of the sentence structure is perhaps unnecessarily heavy, some descriptions are not very clear and the relations of some chapter subheadings not definite. On the whole, however, this appears to be a valuable book which should be read by anyone who does otologic surgery.

J. C. GALLOWAY.

[1] THE EARLY DIAGNOSIS OF THE ACUTE ABDOMEN. By Zachary Cope, B.A., M.D., M.S. (Lond.), F.R.C.S. (Eng.). 3d. ed. London and New York: Oxford University Press, 1925.

[2] OTOLOGIC SURGERY. By Samuel J. Kopetzky, M.D., F.A.C.S. New York: Paul B. Hoeber, 1925.

IN their preface to the first edition of *An Index of Treatment*,[3] the editors state that the work is intended for the general practitioner as a guide for treatment. They frankly admit that a work such as this is bound to be marked by some omissions. The present volume is of encyclopædic dimensions, containing over one thousand pages. Among the contributors one finds the best known English medical writers. The subjects are treated in an alphabetic order so that one finds on the same page acidosis and acne vulgaris; Addison's disease is followed by adenoids. The analogy to a dictionary forces itself upon the reviewer, and yet one must admit the usefulness of the arrangement in a work of this type. Most of the chapters are well written within their necessarily limited space. On the whole, it appears that the medical subjects are treated more adequately than the surgical. One might point out, for instance, that in the discussion of hæmatemesis from gastric ulcer (p. 379) blood transfusion is not mentioned. Quite disappointing is the chapter on exophthalmic goiter. Its author does not seem to be aware of the brilliant achievements in this field of surgery brought about by the proper pre-operative use of Lugol's solution, followed at the height of improvement by a radical thyroidectomy. Instead, he recommends a fair trial of medical treatment, roentgenotherapy, arsenic, etc. This chapter surely needs to be rewritten. In spite of a few such imperfections the work is well done. It contains a vast amount of information in a form which affords the practitioner easy access.

GEORGE HALPERIN.

THE radiological investigation of the male urethra[4] is the theme of a monograph by Kohnstam and Cave.

The authors have developed a technique which, from their description, is quite simple and easily followed. They recommend the use of lipiodol, a compound of 40 per cent iodine in oil of poppies, as the best contrast medium for this work, it being less irritating and producing a much denser shadow than other solutions that have been used. They have developed a special apparatus for injection while plates are being made, so that the entire urethra is filled with the solution at the time of exposure. At least three exposures are taken, (1) posterior anterior, (2) right oblique, (3) left oblique. A fourth, to demonstrate residual urine, is taken after the patient has evacuated.

By this method many very interesting pathological lesions of the urethra and prostate are shown, such as

[3] AN INDEX OF TREATMENT BY VARIOUS WRITERS. Edited by Robert Hutchison, M.D., F.R.C.P., and James Sherren, C.B.E., F.R.C.S. 9th ed., revised and enlarged. New York: William Wood and Company, 1925.

[4] THE RADIOLOGICAL EXAMINATION OF THE MALE URETHRA. By G. S. Kohnstam, M.R.C.S. (Eng.), L.R.C.P. (Lond.), and E. H. P. Cave, M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.M.R.E. (Camb.). New York: William Wood and Company, 1925.

the size and position of false passages, the location and size of strictures, and the hypertrophied prostate.

A description of the normal urethra and prostate and a number of physiological facts suggest new methods and objections to some old practices in the treatment of diseases of the prostate, urethra, and seminal vesicles.

The monograph is profusely illustrated with photographs, diagrams, and plate studies of the normal as well as the pathological conditions. The authors have at least laid a very good foundation for future study in the use of the roentgen rays for the differential diagnosis of conditions of the male urethra.

B. C. CUSHWAY.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

THE DIAGNOSIS AND TREATMENT OF TUBERCULOSIS OF THE HIP. By G. R. Girdlestone, B.M. (Oxon.), F.R.C.S. New York: Oxford University Press, 1925.

REPORT OF THE SCIENTIFIC WORK OF THE SURGICAL STAFF OF THE WOMAN'S HOSPITAL IN THE STATE OF NEW YORK. Edited by George Gray Ward, M.D., Vol. v, 1923–1924. St. Louis: The C. V. Mosby Company, 1925.

PROCEEDINGS OF THE NINETEENTH ANNUAL MEETING OF THE ASSOCIATION OF LIFE INSURANCE PRESIDENTS; HELD IN THE HOTEL ASTOR. New York, 1925.

SUI TUMORI AD EZIOLOGIA POST-TRAUMATICA. Dott. Piero Alonzo.

A HANDBOOK FOR SENIOR NURSES AND MIDWIVES. By J. K. Watson, M.D. (Edin.), Capt., R.A.M.C. New York: Oxford University Press, 1926.

THE PATHOLOGY OF TUMOURS. By E. H. Kettle, M.D., B.S. (Lond.). 2d ed. New York: Paul Hoeber, Inc., 1925.

BIOLOGIE UND PATHOLOGIE DES WEIBES, etc. By Josef Halban and Ludwig Seitz. Berlin: Urban & Schwarzenberg, 1926. Lieferung 21.

ÉTUDE ANALYTIQUE ET SYNTHÉTIQUE DE LA SYMPATHECTOMIE PÉRIARTÉRIELLE APPLIQUÉE AU TRAITEMENT DES ULCÈRES CHRONIQUES DES MEMBRES INFÉRIEURS, etc. By Dr. Guillermo Garcia-Diaz. Paris: Le François, 1925.

THE MELANOMATA; THEIR MORPHOLOGY AND HISTOGENESIS. By James W. Dawson, M.D., D.Sc., F.R.C.P.E. Edinburgh: Oliver and Boyd, 1925.

OPERATIVE CYSTOSCOPY. By E. Canny Ryall, F.R.C.S. St. Louis: C. V. Mosby Co., 1925.

CANCER OF THE RECTUM. Lettsonian lectures delivered before Medical Society of London, February 19, March 7 and March 26, 1923. By W. Ernest Miles, F.R.C.S. London: Harrison and Sons, Ltd., 1926.

RECENT ADVANCES IN OBSTETRICS AND GYNÆCOLOGY. By Aleck W. Bourne, B.A., M.B., B.Ch. (Camb.), F.R.C.S. (Eng.). Philadelphia: P. Blakiston's Son & Co., 1926.

THE EVOLUTION OF ORTHOPÆDIC SURGERY. By Robert B. Osgood, M.D. St. Louis: The C. V. Mosby Co., 1925.

MANIPULATIVE SURGERY; PRINCIPLES AND PRACTICE. By A. G. Timbrell Fisher, M.C., F.R.C.S. (Eng.). New York: The Macmillan Company, 1926.

TRANSACTIONS OF THE AMERICAN PROCTOLOGIC SOCIETY, TWENTY-SIXTH ANNUAL SESSION, MAY 25–26, 1925. New Bedford, Massachusetts: George H. Reynolds, 1926.

TRANSACTIONS OF THE AMERICAN GYNECOLOGICAL SOCIETY. VOLUME 50, 1925. Edited by Arthur H. Curtis, M.D. Philadelphia: W. J. Dornan, 1925.

THÉRAPEUTIQUE CHIRURGICALE. By P. Lecéne and R. Leriche. Vol. iii—Abdomen et Organes Genito-Urinaires. By P. Lecéne. Paris: Masson et Cie, 1926.

INTERNATIONAL CLINICS; A QUARTERLY. Edited by Henry W. Cattell, A.M., M.D. Vol. i. 1926. Philadelphia and London: J. B. Lippincott Company, 1926.

A DIGEST AND AN EDITORIAL ARTICLE OF THE FEDERAL NARCOTIC LAWS AS THEY APPLY TO DOCTORS OF MEDICINE. Los Angeles, California: Los Angeles County Medical Association, November, 1925.

FACTS ON THE HEART. Richard C. Cabot, M.D. Philadelphia and London: W. B. Saunders Company, 1926.

GASTRIC FUNCTION IN HEALTH AND DISEASE. By John A. Pyle, M.D. (Lond.), F.R.C.P. New York: Oxford University Press, 1926.

VISUAL FIELD STUDIES. By Ralph I. Lloyd, M.D., F.A.C.S. New York: The Technical Press, 1926.

YOUNG'S PRACTICE OF UROLOGY; BASED ON A STUDY OF 12,500 CASES. By Hugh H. Young and David M. Davis with Collaboration of Franklin P. Johnson. Vols. i and ii. Philadelphia and London: W. B. Saunders Company, 1926.

AN INTRODUCTION TO SURGERY. By Rutherford Morison, M.D., F.R.C.S. (Edin.), F.R.C.S. (Eng.), M.A., D.C.L., LL.D., and Charles F. M. Saint, C.B.E., M.D., M.S., F.R.C.S. (Eng.). 2d ed. New York: William Wood and Company, 1925.

CÆSAREAN SECTION. By Herbert R. Spencer, M.D., F.R.C.P. New York: William Wood & Company, 1925.

MANUAL OF EMERGENCIES; MEDICAL, SURGICAL AND OBSTETRIC. THEIR PATHOLOGY, DIAGNOSIS AND TREATMENT (BASED UPON LENZMANN'S "EMERGENCIES IN MEDICAL PRACTICE"). By J. Snowman, M.D., M.R.C.P. Second edition. New York: William Wood and Company, 1926.

PUERPERAL SEPTICÆMIA: ITS CAUSATION, SYMPTOMS, PREVENTION AND TREATMENT. By George Geddes, M.D., C.M. New York: William Wood and Company, 1925.

HANDBOOK OF DISEASES OF THE RECTUM. By Louis J. HIRSCHMAN, M.D., F.A.C.S. 4th ed. rev. St. Louis: The C. V. Mosby Company, 1926.

MODERN METHODS OF AMPUTATION. By Thomas G. Orr, A.B., M.D., F.A.C.S. St. Louis: The C. V. Mosby Company, 1926.

THE MEDICAL DEPARTMENT OF THE UNITED STATES ARMY IN THE WORLD WAR. Vol. viii—Field Operations. Prepared under the direction of Maj. Gen. M. W. Ireland by Col. Charles Lynch, M.C., Col. Joseph H. Ford, M.C., Lieut. Col. Frank W. Weed, M.C. Washington: Government Printing Office, 1925.

LES RESULTATS ACTUELS DU TRAITEMENT CHIRURGICAL DE L'ANGINE DE POITRINE. By Dr. Rene Fontaine. Strasbourg: University of Strasbourg Publications.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

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1926 CLINICAL CONGRESS IN MONTREAL

THE sixteenth annual Clinical Congress of the American College of Surgeons will be held in Montreal, Quebec, October 25 to 29, 1926, inclusive. The committee on arrangements, under the leadership of Dr. Alfred T. Bazin, is preparing a program of clinics and demonstrations to be given in the hospitals and medical schools that will adequately represent the clinical activities of Canada's great medical center. All departments of surgery will be included: general surgery, gynecology, obstetrics, orthopedics, urology, and surgery of the eye, ear, nose, throat, and mouth. It is expected that a preliminary clinical program will be published in the next issue of this journal.

Since the 1920 session of the Clinical Congress in Montreal a number of new hospitals have been built and additions made to the older hospitals so that the clinical facilities in that city have been materially increased. Those who attended the 1920 session will recall with great pleasure the splendid clinical program offered by the surgeons of Montreal, and one may confidently expect that the program for this year's session will provide a larger and still more interesting series of clinics.

A committee, of which Dr. Albert LaSalle, ophthalmic surgeon to Hotel Dieu, is chairman, is preparing a special program of clinics, demonstrations, and papers that will be of particular interest to visiting surgeons who practice surgery of the eye, ear, nose, and throat.

Clinics and demonstrations are to be given at the following institutions: McGill University and University of Montreal medical schools; and the Children's Memorial, Hotel Dieu, Misericordia, Montreal General, Notre Dame, Royal Victoria, Saint Justine, and Shriners' hospitals.

The executive committee of the Clinical Congress is preparing programs for the scientific meetings to be held each evening in Windsor Hall at the Windsor Hotel. At these evening sessions papers dealing with surgical questions of present day interest will be read and discussed by eminent surgeons of the United States and Canada and by distinguished surgeons from abroad.

At the presidential meeting, to be held on Monday evening in Windsor Hall, the President-Elect, Dr. Walter W. Chipman, of Montreal, will be inaugurated and deliver the annual address. In the same room on Friday evening will be held the fourteenth annual convocation of the College.

The annual conference on the hospital standardization program of the College and the problems related thereto will be held in Windsor Hall at the Windsor Hotel on Monday and Tuesday, occupying both the morning and afternoon hours. The program for this conference will be published shortly and will outline an interesting series of papers and discussions of matters related to the conduct of hospitals presented by surgeons, superintendents, nurses, trustees, and others.

General headquarters for the Congress will be established at the Windsor Hotel on Dominion Square, where the Windsor Hall, Rose, Blue and

Oak rooms, and other large rooms and foyers located on the ground floor, have been reserved for the exclusive use of the Congress. More than a million dollars has been expended in recent years in remodeling and enlarging the Windsor Hotel. It is now under the same management as the Waldorf-Astoria in New York, the Bellevue-Stratford in Philadelphia, and the New Willard in Washington.

The hotel situation in Montreal has been greatly improved by the erection of a new hotel with over 1,200 rooms—the Mount Royal—located on Peel Street, two blocks north of the Windsor Hotel. The Queen's Hotel on Peel street near the Bonaventure Station, two blocks from the Windsor, has been remodeled and a new section added that doubles the capacity of that hotel.

In addition to the hotels named above, rooms have been reserved at the Ritz-Carlton, located at the corner of Mountain and Sherbrooke streets, four blocks from the Windsor Hotel; the Corona on Guy Street; and the Place Viger. We are assured of ample, comfortable accommodations at these hotels for more than 3,000; and, with the exception of the Place Viger, all of the hotels mentioned are within short walking distance of headquarters.

Following the plan in effect at all sessions in recent years, it will be necessary to enforce strictly the rule limiting attendance at the Congress to a number that can be comfortably accommodated at the clinics. The limit of attendance will be based on the result of a survey of the operating rooms, amphitheaters, lecture rooms, and laboratories in the hospitals and medical schools as to their capacity for accommodating visitors. This plan necessitates registration in advance on the part of all who wish to attend the Congress. When the limit of attendance has been reached through advance registration, no further application can be accepted.

Attendance at all clinics and demonstrations will be controlled by means of clinic tickets to insure against overcrowding and to provide for the distribution of visiting surgeons among the several clinics. The number of tickets issued for any clinic will be limited to the capacity of the room in which that clinic is to be given.

An application will be made to the railways of the United States and Canada for reduced fares on account of the meeting in Montreal, and it is practically assured that a rate of one and one-half the regular one-way fare will be authorized for this occasion, under the same conditions as have prevailed at sessions in recent years.

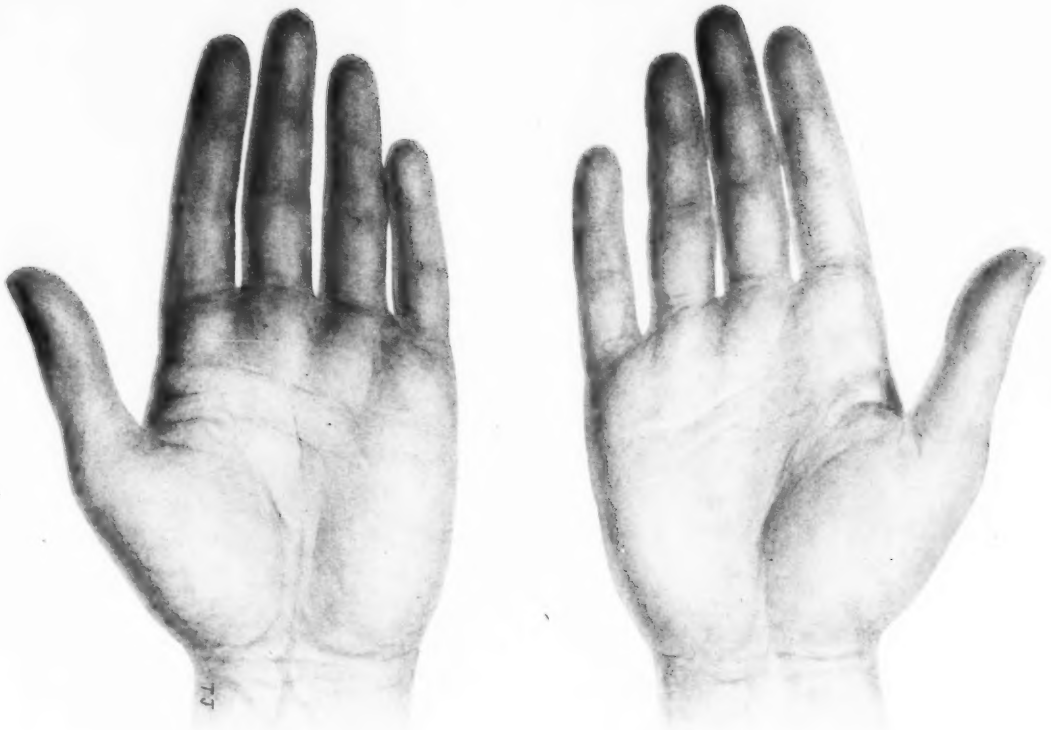

Plate I. Right and left hands of patient with Raynaud's disease after removal of right cervical sympathetic chain and the right stellate ganglion. Sketched during an attack of local syncope and asphyxia.

Sympathectomy in Raynaud's Disease, Erythromelalgia, and Other Vascular Diseases of the Extremities.—Loyal Davis and Allen B. Kanavel.